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Aerometric measurement and modeling of the mass of CO₂ emissions from Crystal Geyser, Utah

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Abstract

Crystal Geyser in eastern Utah is a rare, non-geothermal geyser that emits carbon dioxide gas in periodic eruptions. This geyser is the largest single source of CO₂ originating from a deep reservoir. For this study, the amount of CO₂ emitted from Crystal Geyser is estimated through measurements of downwind CO₂ air concentration applied to an analytical model for atmospheric dispersion. Five eruptions occurred during the 48-hour field study, for a total of almost 3 hours of eruption. Pre-eruption emissions were also timed and sampled. Slow wind during three of the active eruptions conveyed the plume over a grid of samplers arranged in arcs from 25 to 100 m away from the geyser. An analytical, straight-line Gaussian model matched the pattern of concentration measurements. Plume width was determined from least-squares fit of the CO₂ concentrations integrated over time. The CO₂ emission rate was found to be between 2.6 and 5.8 kg/s during the eruption events, and about 0.17 kg/s during the active pre-eruptive events. Our limited field study can be extrapolated to an annual CO₂ emission of 12 kilotonnes from this geyser. As this is the first application of Gaussian dispersion modeling and objective timing to CO₂ emissions from a geyser of any type, the present study demonstrates the feasibility of applying this method more completely in the future.

Introduction

Motivation for study

To address concerns regarding potential leakage of CO₂ from underground storage sites, appropriate analogs can serve to circumscribe likely scenarios for human health and safety. The most direct routes by which sequestered CO₂ may potentially pose significant human hazards involve surface release of CO₂ after eventual encroachment of a sequestered CO₂ plume upon preexisting conduits, such as (e.g., unmapped, abandoned) wells with leaky or absent casing, or fracture zones near unmapped faults. Many hundreds of thousands of abandoned wells are thought to exist at potential sequestration sites. Crystal Geyser in Utah—a prospective oil well that was abandoned in the 1930s with no barrier installed after encountering a natural CO₂ reservoir rather than oil (Baer and Rigby, 1978; Rinehart, 1980)—provides an example of how an unimpeded conduit to the surface now allows substantial amounts of CO₂ gas to be released to the terrestrial surface. The current study was conducted to obtain direct emission mass and timing data from Crystal Geyser. This information can be used to estimate potentially substantial CO₂ emissions from this unfettered conduit—levels that could pose serious hazards to nearby campers or residents under certain realistic topographic and wind speed conditions.

Geology of Crystal Geyser

Crystal Geyser is located in southeastern Utah near the town of Green River, approximately 170 miles SE of Salt Lake City (Figure 1). The geyser erupts out of the well casing for Glen Ruby and Associates' No. 1-X hydrocarbon exploration well that was drilled to a depth of 801 m in 1935-36. Before encountering bedrock, Ruby *et al.* encountered 21.5 m of tufa deposits (Baer and Rigby, 1978). They then drilled through the Mesozoic sedimentary units comprised, from youngest to oldest, by the Jurassic Entrada, Carmel, Navajo, and Wingate-Kayenta Formations, the Triassic Chinle and Moenkopi Formations, and they stopped drilling when they intersected the Permian carbonates. These Mesozoic sedimentary units are dominated by clastic sandstone and shale lithologies although some carbonate units have been observed in these strata (Shipton *et al.*, 2004a). Similar lithologies dominate the surface geology, as seen in the nearby Jurassic Curtis and Summerville Formations and the Cretaceous Cedar Mountain, Dakota, and Morrison Formations.

The thick tufa deposits previously mentioned indicate that CO₂-charged waters effused from this location prior to the drilling of the well. Other natural cold-water geysers (e.g. Woodside,

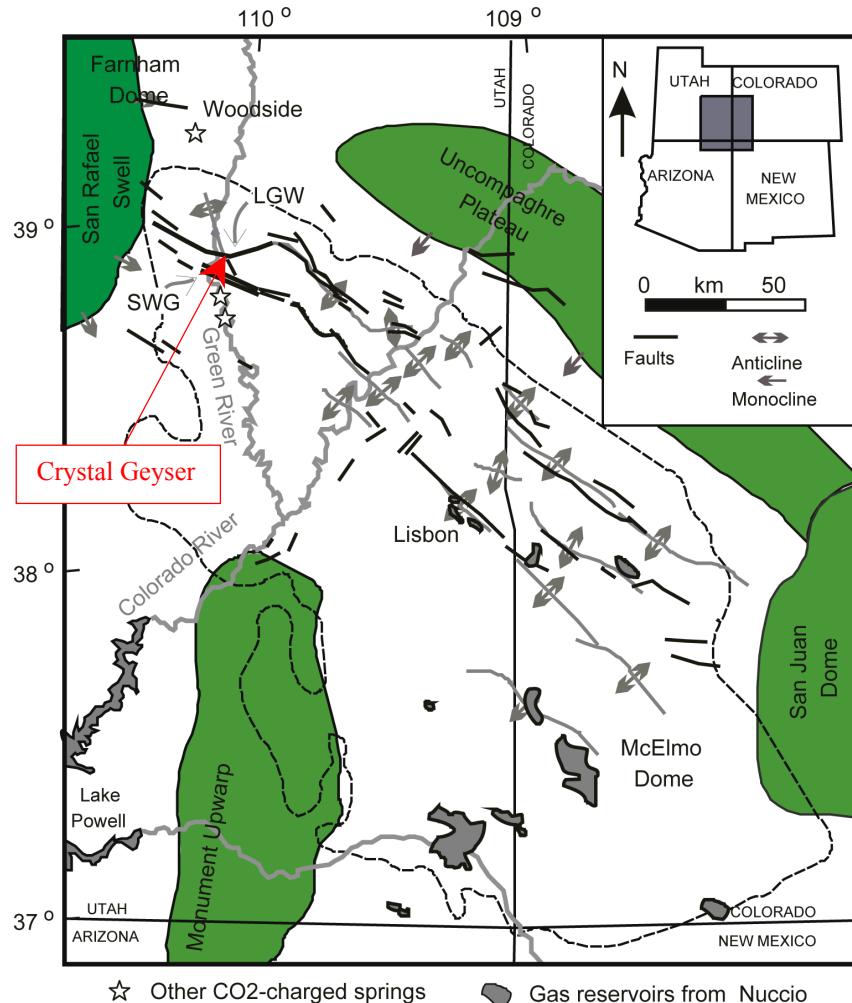


Figure 1. Map from Shipton *et al.*, (2004b) showing location of Crystal Geyser and regional geologic features. Inset shows regional location.

Farnham Dome, Tenmile Geyser) are located in this area of Utah, most of which are probably fed by CO₂-charged waters stored in the Navajo Sandstone (Baer and Rigby, 1978; Shipton *et al.*, 2004a). The Navajo Sandstone aquifer is probably recharged by an area extending as far west as 15 miles, along the east side of the San Rafael Swell (Baer and Rigby, 1978). The top of the unit was encountered 200 m below the surface at Crystal Geyser.

Just as the flow of CO₂-charged waters to the surface can account for numerous cold-water geysers in this region, the flow of CO₂-rich brines to the surface likely accounts for the occurrence of numerous ancient travertine deposits in this region. The locations of the geysers and travertine deposits reflect structural controls, such as fault intersections and the junctions of regional faults with fold axes (Figure 2).

Several ancient travertine deposits are found locally along the strike of the Little Grand Wash Fault (see Figure 2), one of several WNW trending faults in the area that are steeply (70-80°) south-dipping. This 61-km long transverse normal fault has accommodated between 54 and 64 m of vertical separation near the Green River (Shipton *et al.*, 2004b). Near Crystal Geyser, the fault is expressed as two separate strands, and most of the offset has occurred on the southern strand (Shipton *et al.*, 2004b).

The Green River Anticline is likely a salt-anticline formed by deformation of overlying strata resulting from upwelling of late Paleozoic-age evaporite deposits, namely those of the Pennsylvanian Paradox Formation (Shipton *et al.*, 2004a). This type of structural deformation and hydrocarbon trap is typical of the Paradox Basin, a northwest-trending geologic province in southeastern Utah and southwestern Colorado (Figure 1).

The Paradox Basin was a rapidly subsiding trough during the Pennsylvanian period (325-286 Ma) that accumulated a thick sequence of coastal and shallow ocean deposits (Nuccio and Condon, 1996). Today the basin is demarcated by the extent of organic-rich Pennsylvanian and

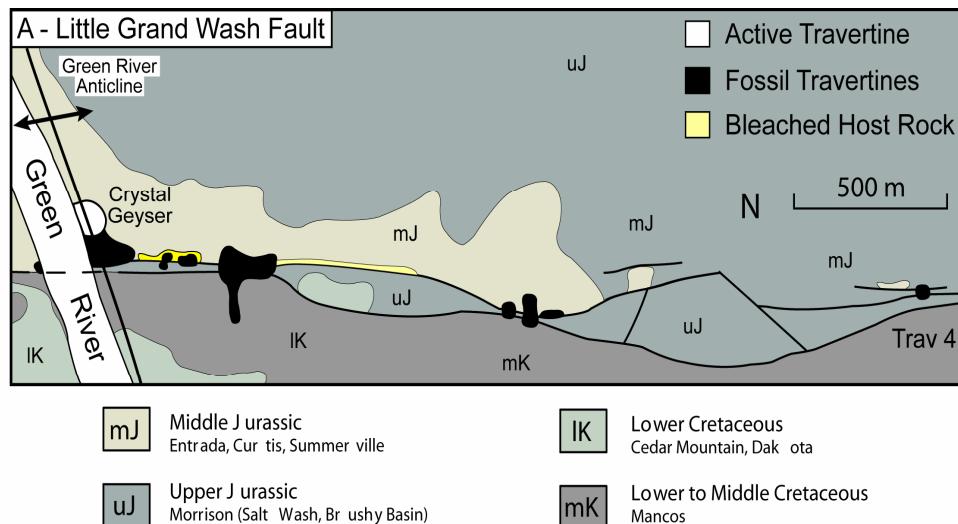


Figure 2. Generalized geologic map of the Little Grand Wash Fault in the Crystal Geyser region (Shipton *et al.*, 2004b). Note that Crystal Geyser is located at the intersection of the Little Grand Wash Fault and the axis of the Green River Anticline.

Permian limestones, shales, and evaporites. The Paradox Basin hosts several well-known CO₂ reservoirs, including McElmo Dome. This field located in southwestern Colorado (Figure 1) is the site of the largest active production from natural CO₂ fields in the Colorado Plateau-Southern Rocky Mountain region (Allis *et al.*, 2001).

Although numerous CO₂ reservoirs within the Paradox Basin have been identified, and sometimes developed for CO₂ production, researchers have been unable to definitively identify the source of the CO₂ for this region. Measured helium isotope signatures are similar to crustal values, negating the notion of a mantle CO₂ source (Shipton *et al.*, 2004a). Baer and Rigby (1978) suggest that the CO₂ could result from dissolution of minerals as slightly acidic groundwaters percolate through the Navajo Sandstone. However, more recent investigations by Shipton *et al.* (2004a, b) of carbon isotopic signatures suggest that the CO₂ results from clay-carbonate diagenetic reactions occurring at temperatures in the range of 100-200°C. The likely lithologies in which such reactions could proceed are the mid-to-upper Paleozoic strata found deep in the Paradox Basin (Shipton *et al.*, 2004a, 2004b). Thus, if this scenario is the accepted source for the CO₂, the gas had to have migrated through at least portions of the Paradox salt formation, which usually provides a seal for hydrocarbon and gas migration (Shipton *et al.*, 2004a, 2004b). Therefore, the Little Grand Wash fault and other faults of the regional WNW trending set of faults likely provide fluid pathways along which the gases travel to shallower stratigraphic levels, ie. the Navajo Sandstone.

CO₂ emission studies

Several methodologies have been employed to estimate the mass of natural gaseous emissions from volcanic and geothermal systems. Estimates of magma emplacement rates are combined with carbon content to determine the potential amount of magmatic CO₂ that could be released (Werner and Brantley, 2003). To measure diffuse soil emission from large areas, small chambers are used to capture and accumulate the emissions directly at the soil surface (Lewicki *et al.*, 2003; Wells *et al.*, 2001). These measurements are often used to predict seismic activity. Although eddy correlation measurements have been applied for decades to measure the CO₂ flux from forest and agricultural sites (Baldochi, *et al.*, 1988), it is only recently that this technique was used to measure CO₂ flux from an active geothermal region (Werner *et al.*, 2000). Eddy correlation measurements using high-speed sampling from collocated vertical wind and CO₂ sensors are considered an improvement over flux chambers in certain cases

Remote sensing is often used in conjunction with a simple box model to reconstruct the source emission from large volcanic plumes (McGee and Gerlach, 1998). A similar box model and profile measurements made on an aircraft were used to estimate the total CO₂ and SO₂ emissions from Mount Etna, Italy (Allard *et al.*, 1991) and Mount Saint Helens (Harris *et al.*, 1981). The box models require sufficient sampling of the entire vertical and horizontal extent of the plume.

Dispersion tests

Classic dispersion studies estimate the dilution of a known release mass with measurements of downwind concentrations. Simultaneous meteorological measurements are used to classify the turbulence conditions that produced the dilution. Allwine *et al.* (2002) describe a recent dispersion study in Salt Lake City.

Present study

Estimating the amount of CO₂ released from Crystal Geyser requires a modification of the methods used in the previous geothermal-emission studies and the classic dispersion tests. Since this geyser is a single, discrete source of CO₂, the eddy-correlation methods may not be appropriate. FTIR instruments are difficult to deploy and operate, and require access to both extreme crosswind tails of the plume.

We employed a new approach at Crystal Geyser. Measurements of the CO₂ concentration downwind of the erupting geyser were combined with wind measurements to estimate the amount of CO₂ released. The CO₂ concentrations were integrated over time at each location, and the best-fit Gaussian shape was calculated based on all available data on an arc. That bell-shaped curve can be considered the most likely cross section of the plume, providing the best-fit estimates for centerline position, centerline concentration, and plume width. An analytical expression can then be used to reconstruct the emission rate. Fitting the concentration data to a Gaussian plume in this way avoids errors or bias originating from undersampling the plume.

Before detailing the methods and results, a general description of the field site is necessary. Crystal Geyser is just 50 m from Green River. The surrounding region is sparsely vegetated. Although the area immediately around Crystal Geyser is fairly level, the terrain greater than 100 m away is topographically complex. The term “main vent” or “primary vent” is used to delineate the principal site of emissions from a smaller, peripheral vent where there is not explosive activity but instead only minor bubbling. Other physical aspects of the field area are described in subsequent sections when such information is pertinent.

Methods

Three basic types of measurements were made during our October 2004 field study: wind, temperature at the base of the geyser, and CO₂ concentration in air downwind of an erupting geyser.

Meteorology

A single meteorological monitoring station was placed about 25-m southeast of the primary geyser vent. This station included sensors for wind, air temperature, and humidity. All sensors were polled every 2 seconds. A Campbell Scientific model CR510 data logger collected five-minute averages and standard deviations.

A Vaisala sonic anemometer (model 425A) measured horizontal components of the wind. The data logger saved values for averages of wind speed and direction, and the standard deviations of wind speed and wind angle. The orientation of the wind sensor was accomplished by standing due south of the sensor and rotating it to line up with the observer. We used a GPS device to insure proper alignment with a north-south line.

Air temperature was measured with a Handar model 432A sensor. This device converts the resistance of a YSI-44006 thermistor into a linear voltage signal. The thermistor was housed in a Handar model 442A naturally aspirated shield.

For relative humidity, we used the model 50Y Humitter made by Vaisala. The humidity sensor was housed in a 6-plate Gill radiation shield made by RM Young Company. This shield is also naturally aspirated. The temperature and relative humidity sensors were placed about 2 m above the surface.

Before taking the meteorological monitoring station into the field, the accuracy of the measurements was verified. Data from the wind sensor was compared against data taken from similar sensors collocated in a natural setting. Using quality-control procedures before and during the field study, the wind speed was accurate to within 0.1 m/s and the wind direction was within 3 degrees. Proper calibration of the temperature and humidity measurements was validated by comparison against accurate standards in ambient conditions. The air temperature was within 0.5°C and humidity was within 5% of true values.

Temperature

We used a second CR510 data logger to measure temperature at the primary and secondary geysers. Three Campbell Scientific model 107-L water/soil temperature probes were sampled every second and the logger saved 1-minute averages of the data. The design of this thermistor-type temperature probe allows it to be immersed in water. The thermistor is encased in a rubber jacket, which protects the sensor but slows the response to changing temperatures. The sensors used in this study were within 0.1°C of each other.

Samplers

We brought sixteen air samplers into the field. These simple and small devices, called Gray Box samplers, draw a continuous stream of air into a Calibond bag at a rate of 10 cc per minute. Each sampler requires 110 V AC power, supplied by a portable generator (rated 12.5 Amps). The combination of generator, power cords, and samplers allowed us to turn on and off all the Gray Box samplers simultaneously.

We planned to place the Gray Box samplers on arcs 25-, 50-, 75-, and 100-m downwind of the primary geyser. Knowing that the plume width should be about 10 m, we planned to separate the samplers by that distance. This plan was modified conforming to the available lengths of power cords, and the topography of the surfaces downwind of the geyser (Photos G-5 and G-6).

The Grey Box sampler fills a bag relatively slowly. A 0.5-L bag is filled in about 20 minutes, making it appropriate to employ many samplers in an extensive grid. If an emission event lasted more than 20 minutes, a sample bag could easily be replaced with an empty bag.

A second type of air sampler was also used during this study. The Blue Box sampler operates under battery power, therefore we could quickly place this sampler in a new location. The portable Blue Box sampler draws air too quickly to be used for continuous sampling. It takes roughly 20 seconds to fill a 0.5-liter bag with the Blue Box sampler. The Blue Box sampler can easily be used to take samples of air upwind of the geyser, very close to the geyser, and other unusual locations.

Analysis of air samples

Analyses of air samples for carbon dioxide were performed using an SRI 8610C gas chromatograph (GC). This GC was equipped with a nickel-packed catalyst bed (methanizer) run at 375°C, and placed in series between a thermal conductivity detector (TCD) and a flame ionization detector (FID). Using an auxiliary hydrogen make-up gas, the nickel bed catalytically reduced carbon dioxide to methane, enabling high concentrations of CO₂ to be quantified using the TCD, and low concentrations of CO₂ to be quantified using the FID. Sample introduction was done using an electrically actuated VICI/Valco multiport gas-sampling valve with a 1.0-ml sample loop, with direct injection into a 6-foot (1.8 m) x 1/8-inch (0.32 cm) stainless steel silica-gel-packed column. Helium was used as the carrier gas using an isothermal GC run with oven set at 120°C, TCD set at 100°C and FID set at 150°C.

The GC was calibrated using 10 CO₂ standards (Matheson Trigas certified standards or diluted standards). Two separate calibration curves were constructed to quantify samples throughout the entire range. The FID calibration curve (Figure F-1) ranged from 369 to 1.0x10⁴ ppm and the TCD calibration curve (Figure F-2) ranged from 1.0x10⁴ to 48.7x10⁴ ppm. The full set of 10 calibration standards was used to monitor system stability during sample analyses (Table F-1) and selected samples were run in replicate. The concentrations of the CO₂ standards used to construct the calibration curves were in ppm (v/v). Because the Crystal Geyser air samples were run under the same laboratory conditions, the CO₂ concentrations of the air samples were reported as ppm (v/v). But for the modeling purposes it was necessary to convert these analytical results into units of mg/m³. This conversion is compound specific and sensitive to both temperature and pressure. The following equation was used to convert the reported CO₂ concentrations from ppm values (*C*) to mg/m³ (χ), corrected for the actual pressure and temperature conditions at time of collection.

$$\chi = C \frac{PM}{RT} = 0.4760 \frac{C}{T}, \quad (1)$$

where P is pressure in atm (0.8877 atm for Crystal Geyser), M is molecular weight of CO₂ (44 g mol⁻¹), R is the ideal gas law constant (0.08206 L atm K⁻¹ mol⁻¹), and T is temperature in Kelvin.

Dispersion model

A straight-line Gaussian model is often used to estimate the dispersion from many types of emissions (Hanna *et al.*, 1982). The commonly used analytical expression for continuous sources,

$$\chi(x, y, z) = \frac{Q}{2\pi\sigma_y\sigma_z u} E_y E_z, \quad (2)$$

can compute the downwind concentration (χ) at distances downwind (*x*), crosswind (*y*), and vertically (*z*). Equation (2) requires values for emission rate (*Q*), horizontal and vertical plume spread (σ_y and σ_z , respectively), wind speed (*u*), and horizontal and vertical off-centerline adjustments (E_y and E_z , respectively). Formulas for E_y and E_z create the Gaussian shape of the plume,

$$\begin{aligned} E_y &= \exp\left[\frac{y^2}{-2\sigma_y^2}\right] \\ E_z &= \exp\left[\frac{(z-h)^2}{-2\sigma_z^2}\right] + \exp\left[\frac{(z+h)^2}{-2\sigma_z^2}\right] \end{aligned} \quad (3)$$

where h is the height of the release. Both E_y and E_z require formulas for plume spread, which are typically functions of distance downwind and atmospheric stability (for long travel times). The plume spread parameters, σ_y and σ_z , are defined as the standard deviation of the concentration distributions. Equations (2) and (3) are appropriate to model the CO₂ emissions from Crystal Geyser since they assume the effluent is neutrally buoyant, chemically inert, and will not deposit on surfaces.

For our study at Crystal Geyser, we rearrange Eq. (2),

$$Q = \frac{2\pi\sigma_y\sigma_z u \chi}{E_y E_z}, \quad (4)$$

so that our measurements of wind and CO₂ concentration can be used to estimate the emission rate or emission mass. For example, if χ has units of effluent density, g/m³, Eq. (4) will calculate an emission rate with units of g/s. If χ has units for exposure, g·s/m³, then Q will be an emission amount in g.

Wind direction is an important input to Eq. (4). With a measurement of the average wind direction the plume centerline ($y=0$), the geometric relationships between the plume and the sampler locations can be established. In complex terrain, it is possible that a plume near the surface will feature a curved centerline. Examination of the CO₂ concentration data along a single arc may reveal the position of centerline.

Two other important inputs to Eq. (4) are plume width and height. With a sufficient number of samplers along an arc the plume width can be found that will provide the best fit to the concentration data. Although this method can be used to find the best value for vertical plume width, we cannot do this for the current study since we did not locate samplers off the surface ($z>0$).

Irwin (1983) describes an alternative method of computing plume width,

$$\sigma_y = \sigma_\theta x f_y = \sigma_v t f_y, \quad (5)$$

using a measurement of the standard deviations of the wind angle (σ_θ) or crosswind wind speed (σ_v), and a non-dimensional function (f_y). There are several formulas for f_y and it is impossible in this study to evaluate the best one. We will use,

$$f_y = \left(1 + 0.9\sqrt{\frac{t}{1000}}\right)^{-1}, \quad (6)$$

where t is travel time. The vertical form of Eq. (5) is,

$$\sigma_z = \sigma_\phi x f_z = \sigma_w t f_z. \quad (7)$$

Assuming $f_y = f_z$, we can use,

$$\alpha = \frac{\sigma_v}{\sigma_w} = \frac{\sigma_y}{\sigma_z}, \quad (8)$$

to approximate the plume height where α is the aspect ratio of plume width to height.

Uncertainty in α

We did not measure vertical turbulence (σ_w or σ_ϕ) during the October 2004 field program. We also did not measure vertical profiles of concentration that could be used to estimate plume height, σ_z . We can find reasonable values by using Eq. (8), direct measurements of σ_y , and finding an appropriate value for α in published reports. It is clear that the largest source of uncertainty in the above model is in determining the proper value for α . We will vary the value of α in the model to see how it changes the emission estimate.

Typical average values for α near the surface range from 1 to 5. This ratio changes with height and atmospheric stability, and should be somewhat site specific, especially near the surface. There are few studies that present comprehensive results on near-surface crosswind to vertical turbulence ratios. Biltoff (2001) reviewed velocity spectra and variances from eight sonic anemometer studies performed within 10 m of the surface and under a range of stability conditions. The median of σ_v/σ_w from these eight studies was about 3.0. A similar analysis (Gryning and Lyck, 1984) found a median σ_v/σ_w ratio of about 1.5, although these measurements were taken at a height of 115 m. An earlier study by Gryning and Lyck (1980) tabulated data from five tests with the anemometer set at 60 m. They found that α ranged from 1.2 to 1.7 with a median of 1.6. A more recent study (Batchvarova and Gryning, 1998) presented only four data points from turbulence measurements taken at 15 m. The median σ_v/σ_w was 1.8 and the values ranged from 1.6 to 2.2. In summary, α increases closer to the surface with the most likely values between 1.5 and 3.0.

Results

Crystal Geyser field test

During the field test in October 2004, a ridge of high pressure dominated the weather of southeastern Utah. The skies above the geyser site were cloudless for the first 24 hours of the 48-hour study. The forcing winds aloft were light, resulting in weak and inconsistent wind at the surface. The 100-m high slope immediately east of Crystal Geyser directed the wind at the geyser roughly towards the north or south. With this in mind we placed the sampler array north of the geyser.

After arriving at Crystal Geyser at 14:30 (all times are MDT) on 14 October we first set up the meteorological monitoring station near the primary geyser (Photo G-4). The height of the

Table 1. Start and end times, duration, and recharge time of each eruption that occurred during this study. The times are in MDT and have the format hh:mm:ss. The timing of the one pre-eruptive event is noted as 5*. Num shows the number of air samples taken during the event.

Eruption	Date	Start time	End time	Duration	Recharge	Num
1	14-Oct	17:26:30	17:33:40	0:07:10	---	10
2	14-Oct	23:20:00	23:35:00	0:15:00	5:46:20	0
3	15-Oct	6:17:47	8:20:00	2:02:13	6:42:47	72
4	16-Oct	4:19:00	4:29:40	0:10:40	19:59:00	11
5*	16-Oct	9:45:00	9:56:40	0:11:40	---	14
5	16-Oct	10:41:30	11:06:00	0:24:30	6:11:50	31

anemometer was 2.5 m above the travertine surface. A complete listing of this data can be found in Appendix D. We collected almost 46.5 hours of meteorological data for this study.

Crystal Geyser erupted less than 3 hours after our arriving at the site. Table 1 lists the start and end times of all five eruptions that occurred during the study. The duration of each eruption and the recharge period (time between eruptions) are also in Table 1. The total active-eruption time during the 48-hour study was 3 hours. Four of the eruptions lasted between 7 and 25 minutes, one eruption (Eruption 3) persisted for just over 2 hours. The recharge period was typically about 6 hours, except after the period following the 2-hour eruption that lasted almost 20 hours. There seems to be a direct relationship between the duration of an eruption and the subsequent interval of time until the next eruption.

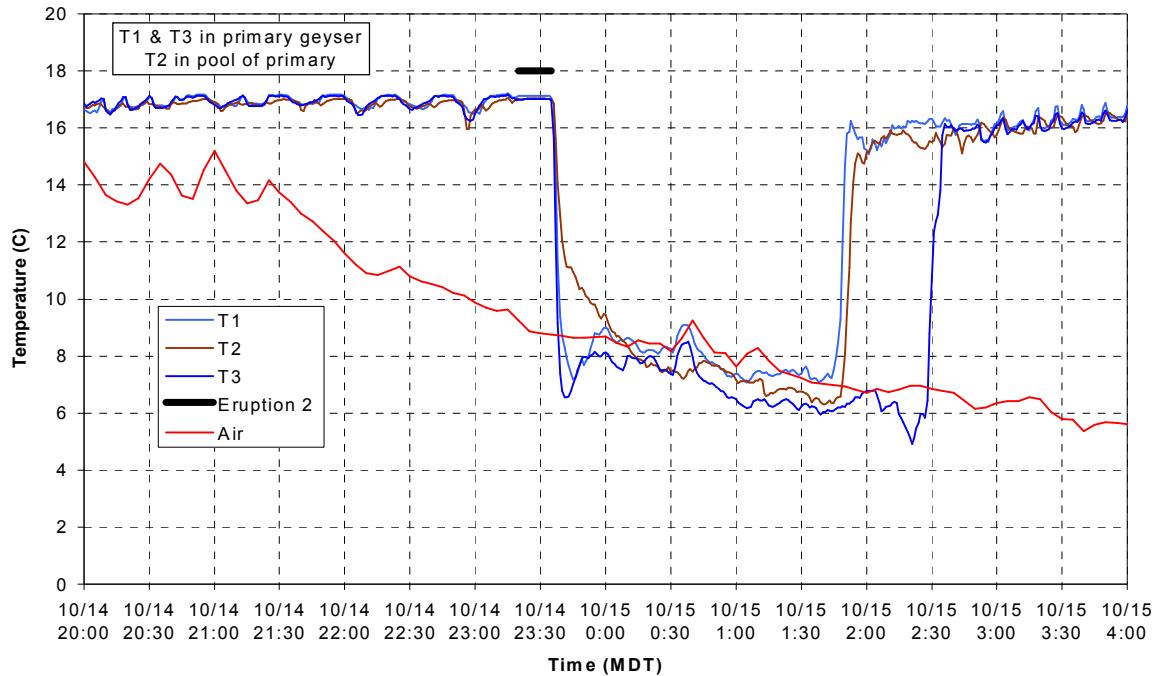


Figure 3. Time traces from the temperature probes at the base of the primary geyser (T1, T2, T3) and the meteorological station (Air). The time of the second eruption event is shown as a bold line.

Temperature probes were installed at the base of the primary geyser after the first eruption. The data from these probes are presented as Appendix E. Temperature probes 1 and 3 were attached to the base of the primary geyser and remained there for the entire field study. Photo G-3 is a close up of the geyser base showing the placement of these probes. Probe 2 was initially placed near the base of the primary geyser in the pool of water. After Eruption 3, this probe was moved to the secondary geyser and held down with a few rocks in hope that the timing of this geyser could be determined.

Without direct visual observations, the timing of Eruption 2 was reconstructed from the temperature data. Figure 3 is a time series of temperature measurements taken during Eruption 2. The temperature data from all five eruptions include the same features illustrated in Figure 3. For Eruption 2, two temperature probes were at the base of the primary geyser and a third probe was near the primary geyser in the pool of water. The air temperature, as measured by the nearby meteorological station, is also in Figure 3. The time of the eruption is marked with a bold line. Prior to the eruption, there are several pre-eruption events where relatively small amounts of water and gas are ejected from the geyser. During the pre-eruption events the pool temperatures increase slightly to just above 17°C, apparently the temperature of the ground water. There were six or seven pre-eruption events before Eruption 2. Immediately after the eruption the water in the pool rapidly drains into the geyser well. When the pool is empty, the temperature quickly approaches the air temperature as the probes are completely exposed. Several hours later the pool fills with water and the probes measure the temperature of the water.

Cartesian coordinates of the samplers and other sites can be found in Appendix A. The goal for locating the samplers was to place them on arcs 25, 50, 75, and 100 m from the primary geyser and about 10 m apart. Figure 4 is a diagram showing the locations of the primary geyser and the samplers. A few of the samplers were moved after Eruptions 1 and 3. The 25-m arc was added after Eruption 4. The wind was blowing the geyser effluent away from the sampler grid during Eruptions 2 and 5, so no samples were taken on the grid. During Eruption 5, only the portable Blue Box sampler was used for air sampling.

We analyzed the CO₂ concentration of 152 samples. Table 1 shows the number of samples taken during four eruptions and one pre-eruption event. Results of these analyses are reported in Appendix B. Also included in this listing are the location, and the start and end times of the sample. The difference between the start and end times is the sample time, which is also listed. Air samples were taken near the primary and secondary geysers during pre-eruptive events (Table B-3).

Four background samples were taken outside the influence of geyser emissions, either upwind or when the geyser was dormant (Table B-7). The average of these four samples is 368±6.7 ppm. This single value for background concentration of CO₂ was used throughout this study. There may be a diurnal variation of CO₂ caused by biological activity, but this must be small since there is relatively little vegetation in the area. The background concentration is subtracted from CO₂ concentration in all calculations of exposure in this paper.

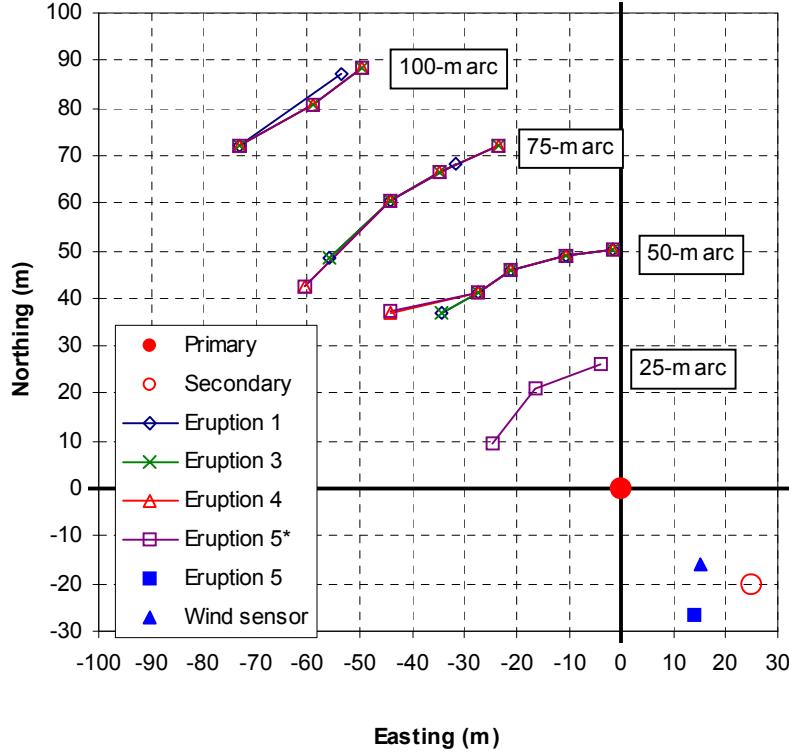


Figure 4. Scaled diagram of locations of samplers, secondary geyser and wind monitor relative to the position of the primary geyser.

Exposure time

Calculation of an emission amount based on Eq. (4) requires that the CO₂ concentration be multiplied by the exposure time, t_e . The product is considered to be the exposure of that location to CO₂. In many cases, the sampling period (t_s) did not completely cover the actual exposure time at the sampler. Sometimes the sampler started after the geyser emissions reached the location of the sampler.

One example of this occurred for the first sample of Eruption 5 (Bag 254 in Table B-6). Although the sample was taken over a 20-second period, the exposure time was extended to 130 seconds to account for the time after the start of the emission and before the start of the sampling (t_b).

The advection time is also considered. For example, during Eruption 4 the samplers were started and stopped at the same time (Table B-4). Since the samplers were started 5 minutes and 20 seconds after the start of the eruption, approximately 320 seconds must be added to the sample time to get the proper exposure time. The time it takes for the leading edge of the plume to reach each sampler is subtracted from the exposure time. This advection time is simply the distance from geyser to sampler (x) divided by the wind speed (u),

$$t_e = t_s + t_b - \frac{x}{u}. \quad (9)$$

Computing the exposure time in this way allows us to more accurately estimate the total exposure of the sampler location to the plume. It is assumed that the concentration found during the sample time is the same as over the entire exposure time.

If more than one sample was taken at a location during an emission event, the individual CO₂ concentration values are multiplied by the corresponding exposure time and the products summed to give us a total exposure (χ_e) at a location throughout the emission,

$$\chi_e = \sum \chi \cdot t_e . \quad (10)$$

Two eruption events (Eruptions 3 and 5) were of sufficient duration to require several samples be taken at the same locations. During the 2-hour-long Eruption 3, the air at each location was sampled using 6 sample bags consecutively (Table B-2). Exchanging the sample bags took only a few seconds, and this amount of time is added to the sample time to get the exposure time.

The wind during Eruption 5 was blowing the plume away from the sample grid. For this eruption, a single Blue Box sampler was placed 30 m downwind of the primary geyser and 31 samples were taken consecutively (Table B-6). Using the Blue Box each bag is filled in just 20 seconds. There was about 20 or 40 seconds of time between the samples when the bags were being swapped and notes taken. The exposure time includes the sample time plus the time between samples.

Evaluation of sigmas

Least-squares fit for σ_y

There are sufficient samplers on the 50-m arc to accurately determine the width of plume. Figure 5 is a plot of exposure values measured on the 50-m arc for Eruptions 1, 3 and 4, and the pre-eruption event before Eruption 5. Included in this figure are the model solutions (Eq. (2)) for these emission events. Two parameters, centerline angle and plume width, are changed to minimize the total squared difference between the measured exposure and the model. The model results for the 50-m arc are presented in Table 2.

The 25-, 75- and 100-m arcs also provided data to yield reasonable values of plume width (Table 3). The modeling of data from these arcs use the centerline angles found for the corresponding 50-m arc. Plume width is found using the same methodology as for the 50-m arcs, although the dearth of data on the 25-, 75- and 100-m arcs results in a wider range of plume width values than were found with the 50-m data. There may also be some curvature of the plume that is not included in this model.

Table 2. Results of least-squares analysis of exposure data from the 50-m arc for four emission events. Eruption 5* denotes the pre-eruption event before Eruption 5.

Eruption	Centerline angle	u m/s	σ_y m	σ_z m	Q tonnes	Q kg/s
1	138	0.9	24.9	12.5	2.5	5.8
3	144	1.2	15.9	8.0	41	5.7
4	138	0.8	16.6	8.3	1.6	2.6
5*	138	2.1	18.2	9.1	0.14	0.17

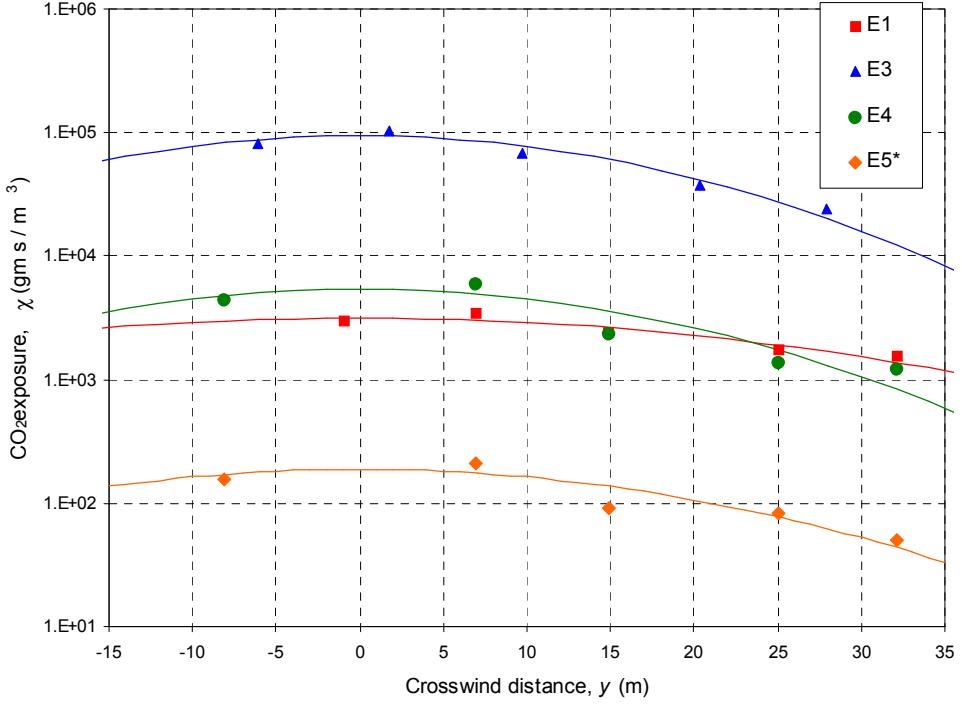


Figure 5. CO₂ exposure for the 50-m arc during four emission events. The exposure values are fitted to a Gaussian model, which is plotted in the same color as the data points.

Figure 6 is a compilation of the σ_y values in Tables 2 and 3. A linear function,

$$\sigma_y = \frac{x}{3} + 0.5, \quad (11)$$

fits the data very well. The intercept of 0.5 m represents the initial width of the geyser plume. This simple function is also physically justifiable based on turbulence measurements made at the site. Solving Eq. (5) for σ_θ , substituting Eq. (11) while ignoring the small intercept, and converting to degrees,

Table 3. Results of least-squares analysis of exposure data from the 25-, 30-, 75- and 100-m arcs for four emission events.

Eruption	Arc	Centerline angle	u m/s	σ_y m	σ_z m	Q tonnes	Q kg/s
3	75	144	1.2	24.7	12.4	27	3.8
3	100	144	1.2	21.8	10.9	13	1.8
4	75	133	0.8	23.6	11.8	1.2	1.9
4	100	138	0.8	21.8	10.9	0.34	0.50
5*	25	138	2.1	9.8	4.9	0.14	0.17
5*	75	138	2.1	55.2	27.6	0.77	0.90
5*	100	138	2.1	21.6	10.8	0.12	0.15
5	30	320	2.0	10.5	5.3	4.0	2.8

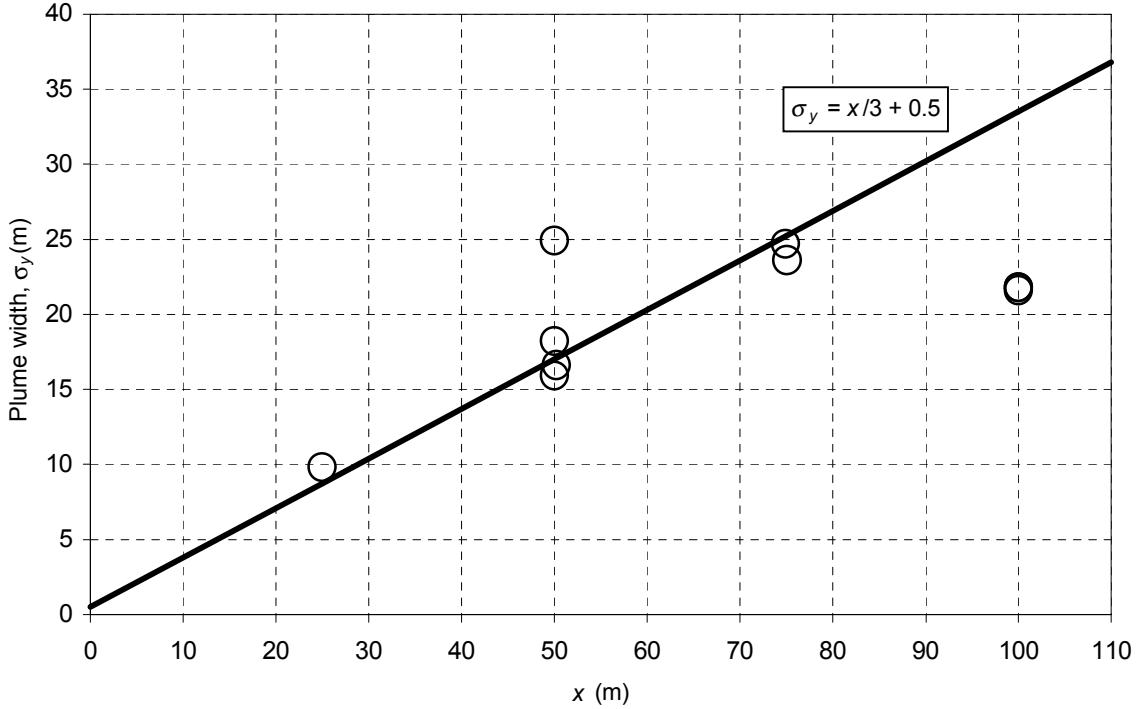


Figure 6. Plume width plotted by distance from primary geyser. A simple linear function provides a reasonable fit of the data.

$$\sigma_\theta = \frac{\sigma_y}{x f_y} = \frac{x/3}{x \cdot 0.8} \cdot \frac{180^\circ}{3.1415\text{rad}} = 24^\circ, \quad (12)$$

we get a plausible value for σ_θ , one that is supported by the σ_θ measurements.

Sensitivity of the model to α

As discussed earlier, the ratio of plume width to height (α) was not directly measured during our field study. Previous studies have found that α should vary with stability, height above ground, and the particular surface characteristics and topography of the site. The value used in our study ($\alpha=2$) represents a defensible, mid-range value from many near-surface studies. By changing this value in our model we can see how the calculated annual emission varies. Figure 7 illustrates the sensitivity of the annual emission over values of α ranging from 1.5 to 3.0. At these extreme values of α the modeled annual emission is only $\pm 30\%$ from our result.

Event reconstruction

Tables 2 and 3 also show values for total emission mass based on Eq. (4), and emission rate. The total emission is divided by the duration of the emission event (Table 1) to give the average rate of emission. The emission amounts measured on the 50-m arc should be considered more accurate than emission measured on the other arcs. The 50-m arc featured five samplers, which contributes to better estimates of the centerline angle and the plume width. The other arcs do offer emission amounts very close to the 50-m estimates, but the analysis of data from these arcs is dependent on the centerline value from the 50-m arc.

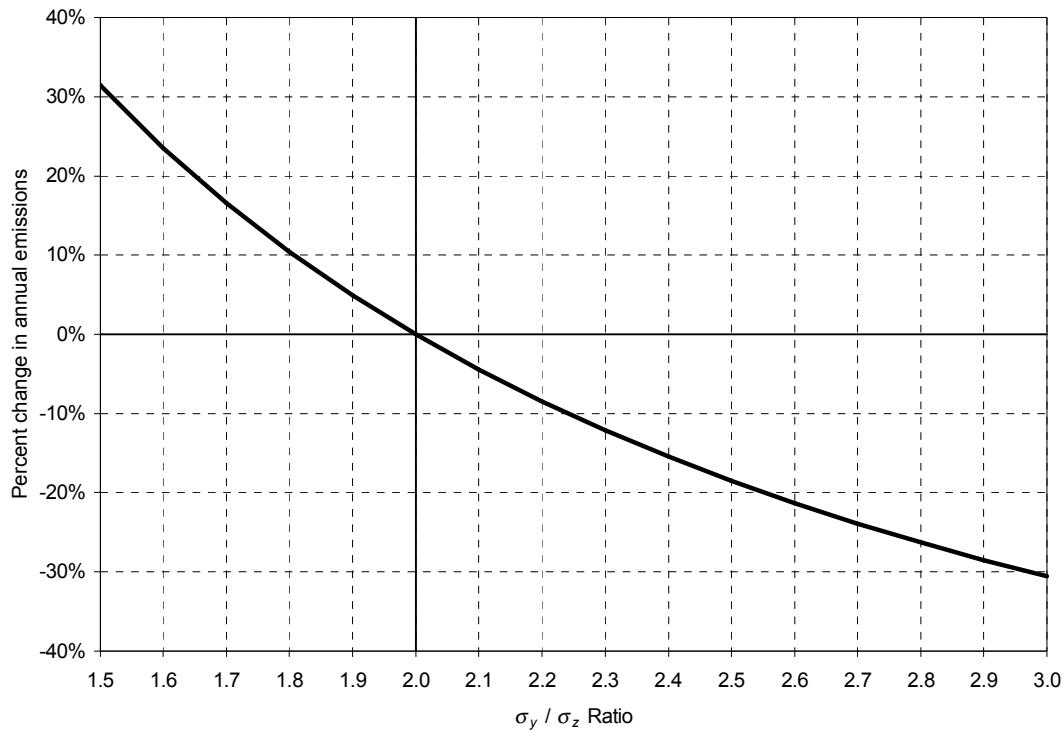


Figure 7. Varying the value of α in the dispersion model will change the estimate for the annual emission amount.

Eruption One

Eruption 1 is a special case among the eruption events. The concentrations measured on the 75- and 100-m arcs do not fit a straightline Gaussian model based on the centerline found on the 50-m arc. It is readily apparent that the centerline beyond 50 m should be curved so that the samplers are positioned on the extreme fringe of the Gaussian curve.

There is a likely physical explanation for a curved plume. Eruption 1 occurred about 3:30 in the afternoon of a cloudless day (See Photo G-1). The cliff to the north of the geyser faces the afternoon sun and, although it wasn't directly measured, the warmer air near this cliff would be relatively buoyant. The air would be drawn up the cliff and toward the northeast in what is often called a valley, or anabatic, wind. The net effect would have the plume curved toward the right and upward.

Arbitrarily, but within the range of reasonable values, we set the plume heights at 10 and 15 m for the 75- and 100-m arcs, respectively. Since our 75- and 100-m arc samplers did not capture the plume centerline, we can use the emission computed by the 50-m arc to find values for centerline position and σ_y that best fit the exposure data from those arcs. Independently for the 75- and 100-m arcs, the plume centerline and σ_y values were changed to find the combination that would yield the smallest total squared deviation from the Gaussian model, while keeping the emission amount at 2.5 tonnes. Table 4 shows the results of this analysis. Indeed, this methodology does produce a realistic curved plume that is drawn up the cliff by the heated air.

Table 4. Results of curved centerline analysis for data from Eruption 1. Best fit values for 75- and 100-m arc centerline angle and σ_y , when emission amounts are set equal to 50-m arc.

Arc	Number of samplers	Source height (m)	Centerline angle	σ_y m
50	5	2	138	24.9
75	3	10	181	25.9
100	2	15	221	35.0

Eruption Two

The sampling grid was not used during Eruption 2. The only evidence we have of this eruption occurring is the temperature record (Figure 3). The wind during this eruption was light and highly variable making the sampling grid of no value.

Eruption Three

Eruption Three was the longest lasting eruption during this field study, actively erupting for over two hours. The recharge time after this eruption was also the longest, taking 20 hours before the next eruption.

Eruption Four

The wind just before this eruption was coming primarily from the west. We were very fortunate that the wind changed direction slightly just before the eruption carrying the plume directly over the sampling grid. For this reason, the air sampling was delayed. The plume sampling did not start for the first 5.33 min of the 10.66 min long eruption. The mass and rate estimates for Eruption 4 in Tables 2 and 3 assume the emissions measured during the second half of the eruption can be applied to the first half of the eruption.

Pre-eruption before Eruption Five

The wind during the pre-eruption event at 9:45 blew the plume toward the sampling grid, so the sampling grid measured this emission (noted throughout as 5*). The 75-m arc should be considered incorrect. One sampler (75m1) did not operate and no sample was taken at that location, leaving us only three samplers on that arc. The resulting analysis for the 75-m arc is not consistent with the analysis from the other 3 arcs. The single pre-eruption event (5*) released less than one tenth of the amount from the smallest active eruptions (1 and 4).

Eruption Five

The wind suddenly shifted about 180° just thirty minutes before the start of Eruption 5. The only sampler available for Eruption 5 was the portable Blue Box sampler, and this sampler was placed on what we perceived to be the centerline. Table B-6 is a listing of the concentration of CO₂ from the thirty-one sample bags collecting air during this eruption. The total exposure for this sampler using Eq. (10) was 10.8 kg·s/m³. With only one sample location, we used Eq. (11) to estimate the plume width (10.5 m).

Emissions summary

The four eruptions of Crystal Geyser were somewhat different from each other in terms of emission mass and average emission rate. The total amount of CO₂ emitted during Eruption 5 was estimated to be 4.0 tonnes, about a factor of two greater than Eruptions 1 and 4 although the emission rate (2.8 kg/s) is very close to the emission rate from Eruption 4. Two of the eruptions (1 and 4) emitted nearly the same amount of CO₂, although the release rate was much greater during Eruption 1, 5.8 kg/s compared to 2.6 kg/s for Eruption 4. The rate of emission for Eruption 1 was identical to that of the 2-hour eruption, Eruption 3. The 2-hour eruption (3) emitted 41 tonnes of CO₂, between ten and twenty-five times the mass emitted during Eruptions 1, 4, or 5.

The small, pre-eruptive events contribute a small amount of CO₂ to the overall amount emitted from Crystal Geyser. If we assume, based on the temperature record, there are six pre-eruptive events before every dynamic eruption, the total mass from these pre-eruptive emissions is still a small fraction of the total CO₂ emission.

The most intriguing discovery of this study was the strong relation between eruption time and subsequent quiet time until the next eruption. The timing information in Table 1 is plotted in Figure 8. Although this relationship is made with just four data points, a strong correlation is evident. The best-fit line indicates the minimum time between eruptions is just less than 5 hours, and for every minute of eruption there should be about 7.4 minutes between eruptions.

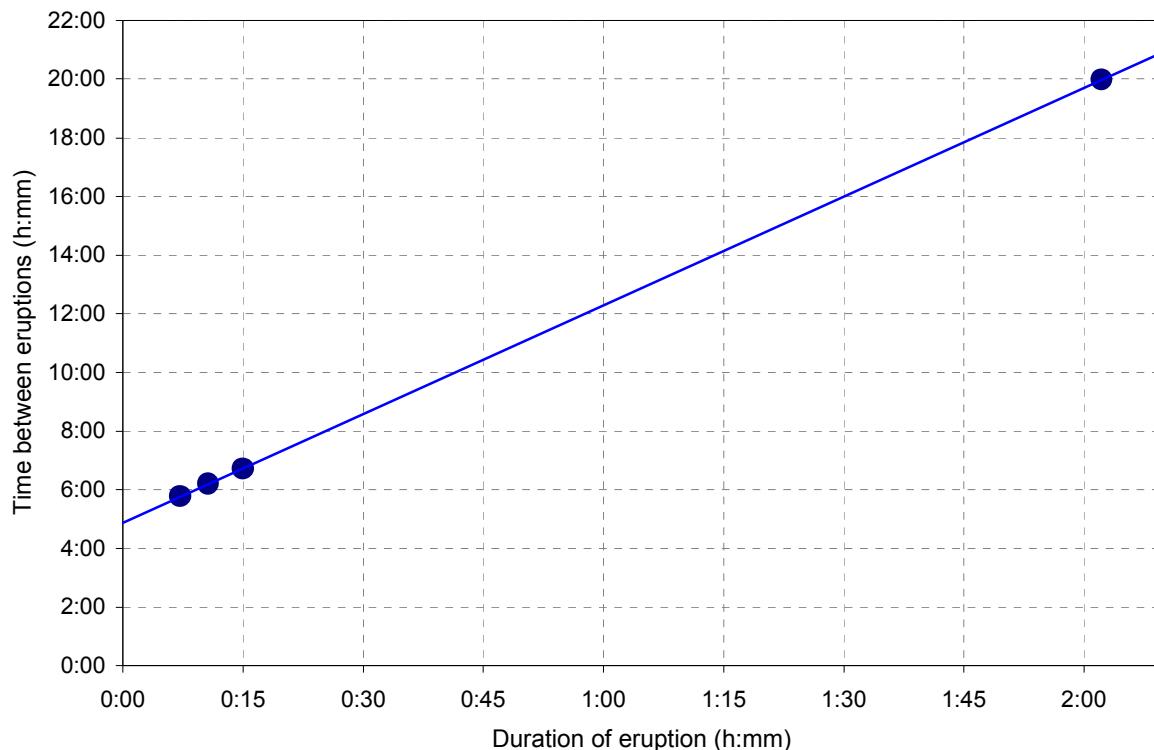


Figure 8. Eruption duration versus time between eruptions. The line is a least squares fit between the four data points.

Future work

Our initial field study can be improved during future studies to Crystal Geyser. Some of these ideas could be accomplished with the equipment we already have. In October 2004 we went to the field with just a few days to prepare. Now with the experience gained during this field trip, and additional ideas, future study can improve our knowledge of the CO₂ emissions.

Obviously, monitoring and sampling more eruptions would add to our knowledge of the frequency, duration and emissions of the eruptions from Crystal Geyser. A temperature or motion sensor would be inexpensive ways to monitor the eruption timing and frequency. Small sensors could be concealed at the base of the geyser to reduce the possibility of being vandalized or disturbed by geyser activity. Over the course of several months, an unattended timing system could monitor hundreds of eruptions.

The October 2004 study included sampling from just a single pre-eruption event. A goal of a future emission study at Crystal Geyser would be to sample during more pre-eruption events.

A 3-D sonic anemometer can be deployed during future field studies to directly measure the horizontal and vertical turbulence, σ_v and σ_w . These wind measurements would corroborate the plume width determined from the exposure measurements as well as provide a better, more site-specific estimate of α .

Two or three more weather stations could be assembled and deployed among the air samplers. These additional wind sensors could detect changes in the horizontal flow that can cause the plume to curve.

A vertical line of samplers could be used to directly measure plume height, σ_z . Several lengths of lightweight plastic tubing could be connected to a ventilator to draw air from four or five heights. The pipes could be supported by a metal fence post, and extend over 15 m above the surface. The best location would be near the centerline of the 50-m arc.

Several other CO₂ vents are within a few miles of Crystal Geyser. These vents are much smaller than Crystal Geyser, and originate in natural fissures in the cap rock. Investigating the timing and CO₂ flux from these small geysers would help us understand the character of a natural CO₂ vent.

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List of Appendixes

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Appendix A – Locations

Table A-1. Location of miscellaneous sites. X is the eastward distance in meters from the primary geyser; Y is the northward distance.

Site	X	Y
Primary vent	0	0
Secondary vent	25	-20
Weather station	15	-16

Table A-2. List of sampler locations during Eruption 1. X and Y have the same definitions as Table A-1.

Sampler	X	Y
50m1	-34	37
50m2	-28	41
50m3	-21	46
50m4	-10	49
50m5	-2	50
75m1	-56	49
75m2	-44	61
75m3	-32	68
100m1	-73	72
100m2	-54	87

Table A-3. Same as Table A-2 but for Eruption 3.

Sampler	X	Y
50m1	-34	37
50m2	-28	41
50m3	-21	46
50m4	-10	49
50m5	-2	50
75m1	-56	49
75m2	-44	61
75m3	-35	66
100m1	-73	72
100m2	-59	81
100m3	-50	88

Table A-4. Same as Table A-2 but for Eruption 4.

Sampler	X	Y
50m1	-44	37
50m2	-28	41
50m3	-21	46
50m4	-10	49
50m5	-2	50
75m1	-61	43
75m2	-44	61
75m3	-35	66
75m4	-24	72
100m1	-73	72
100m2	-59	81
100m3	-50	88

Table A-5. Same as Table A-2 but for the pre-eruptive events before Eruption 5.

Sampler	X	Y
25m1	-25	9
25m2	-16	21
25m3	-4	26
50m1	-44	37
50m2	-28	41
50m3	-21	46
50m4	-10	49
50m5	-2	50
75m1	-61	43
75m2	-44	61
75m3	-35	66
75m4	-24	72
100m1	-73	72
100m2	-59	81
100m3	-50	88

Table A-6. Same as Table A-2 but for Eruption 5.

Sampler	X	Y
30m	-14	-26

Appendix B – Sampling times and concentrations

Table B-1. Information from air samples taken during Eruption 1. Time has the format hh:mm:ss. The background level of CO₂ has not been subtracted from these concentrations.

Sampler	Bag #	Start	End	Sample time (s)	Exposure time (s)	CO ₂ (ppm)
50m1	001	17:27:03	17:35:40	517	517	3505
50m2	002	17:27:03	17:35:40	517	517	3997
50m3	003	17:27:03	17:35:40	517	517	2933
50m4	004	17:27:03	17:35:40	517	517	2190
50m5	005	17:27:20	17:35:40	500	500	2055
75m1	006	17:27:40	17:35:40	480	480	607
75m2	007	17:27:40	17:35:40	480	480	878
75m3	008	17:27:40	17:35:40	480	480	1513
100m1	009	17:27:50	17:35:40	470	470	389
100m2	010	17:27:50	17:35:40	470	470	390

Table B-2. Same as Table B-1 but for air samples taken during Eruption 3.

Sampler	Bag #	Start	End	Sample time (s)	Exposure time (s)	CO ₂ (ppm)
50m1	026	6:19:17	6:39:13	1196	1244	7941
50m1	054	6:39:19	6:55:55	996	1002	3675
50m1	023	6:56:01	7:10:21	860	866	2848
50m1	036	7:10:21	7:35:58	1537	1537	7333
50m1	076	7:36:02	7:55:56	1194	1198	7653
50m1	109	7:56:13	8:22:00	1547	1564	5519
50m2	025	6:19:17	6:39:53	1236	1284	4833
50m2	017	6:39:53	6:56:18	985	985	6154
50m2	022	6:56:26	7:10:47	861	869	3027
50m2	037	7:10:49	7:36:15	1526	1528	12625
50m2	101	7:36:25	7:56:29	1204	1214	9600
50m2	110	7:56:38	8:22:00	1522	1531	6602
50m3	024	6:19:17	6:40:37	1280	1328	5697
50m3	046	6:40:43	6:56:40	957	963	5117
50m3	021	6:56:43	7:11:09	866	869	2083
50m3	038	7:11:11	7:36:39	1528	1530	9645
50m3	100	7:36:49	7:56:56	1207	1217	3026
50m3	111	7:57:00	8:22:00	1500	1504	3624

continued

Sampler	Bag #	Start	End	Sample time (s)	Exposure time (s)	CO₂ (ppm)
50m4	033	6:19:17	6:41:08	1311	1359	3262
50m4	047	6:41:20	6:57:02	942	954	2794
50m4	016	6:57:09	7:11:30	861	868	805
50m4	039	7:11:34	7:37:10	1536	1540	6795
50m4	099	7:37:37	7:57:42	1205	1232	1122
50m4	112	7:57:47	8:22:00	1453	1458	1493
50m5	030	6:19:17	6:41:44	1347	1395	2410
50m5	053	6:41:51	6:57:21	930	937	1917
50m5	015	6:57:30	7:11:46	856	865	765
50m5	040	7:11:54	7:37:52	1558	1566	4320
50m5	098	7:38:02	7:58:04	1202	1212	702
50m5	113	7:58:11	8:22:00	1429	1436	1069
75m1	032	6:19:17	6:44:58	1541	1569	1947
75m1	027	6:45:03	6:59:47	884	889	1004
75m1	043	6:59:55	7:13:39	824	832	1427
75m1	086	7:13:42	7:39:52	1570	1573	2256
75m1	094	7:39:58	8:00:08	1210	1216	2903
75m1	117	8:00:18	8:22:00	1302	1312	1944
75m2	045	6:25:02	6:44:00	1138	1511	2207
75m2	050	6:44:02	6:59:18	916	918	2550
75m2	020	6:59:24	7:13:12	828	834	1435
75m2	085	7:13:16	7:39:26	1570	1574	3324
75m2	095	7:39:32	7:59:42	1210	1216	1062
75m2	116	7:59:46	8:22:00	1334	1334	1964
75m3	029	6:19:17	6:43:21	1444	1472	2114
75m3	051	6:43:32	6:58:40	908	919	2739
75m3	019	6:58:46	7:12:50	844	850	763
75m3	042	7:12:54	7:39:02	1568	1572	3717
75m3	096	7:39:08	7:59:08	1200	1206	651
75m3	115	7:59:29	8:22:00	1351	1372	1286
75m4	028	6:19:17	6:42:44	1407	1434	1470
75m4	052	6:42:52	6:58:12	920	928	1749
75m4	014	6:58:16	7:12:29	853	857	577
75m4	041	7:12:33	7:38:36	1563	1567	2879
75m4	097	7:38:40	7:58:46	1206	1210	524
75m4	114	7:58:52	8:22:00	1388	1394	902

continued

Sampler	Bag #	Start	End	Sample time (s)	Exposure time (s)	CO₂ (ppm)
100m1	034	6:19:17	6:45:52	1595	1599	1144
100m1	048	6:46:08	7:00:28	860	876	908
100m1	044	7:00:34	7:14:14	820	826	622
100m1	087	7:14:17	7:40:24	1567	1570	1477
100m1	093	7:40:34	8:00:46	1212	1222	1353
100m1	118	8:00:54	8:22:00	1266	1274	1275
100m2	018	6:19:17	6:46:34	1637	1644	1496
100m2	049	6:46:44	7:00:54	850	860	1807
100m2	012	7:00:58	7:14:39	821	825	834
100m2	088	7:14:44	7:40:54	1570	1575	2228
100m2	092	7:41:08	8:01:14	1206	1220	802
100m2	119	8:01:18	8:22:00	1242	1246	1230
100m3	031	6:19:17	6:50:19	1862	1868	1339
100m3	035	6:50:32	7:01:21	649	662	1809
100m3	013	7:01:23	7:14:49	806	808	684
100m3	089	7:15:07	7:41:23	1576	1594	2353
100m3	091	7:41:29	8:01:35	1206	1212	747
100m3	120	8:01:38	8:22:00	1222	1225	717

Table B-3. Same as Table B-1 but for air samples taken during pre-eruption emissions of Eruption 4 with the Blue Box sampler. The sample location (X,Y) using the same coordinates as Figure 4.

Vent	Bag #	X	Y	Start	End	Sample time (s)	CO₂ (ppm)
Primary	243	-5.0	-6.9	1:45:41	1:45:59	18	492
Secondary	244	24.3	-15.9	1:56:00	1:56:20	20	1050
Primary	245	2.3	-7.7	2:38:03	2:38:28	25	429
Primary	246	7.7	-6.4	2:50:20	2:50:46	26	8695
Secondary	247	33.4	-21.5	2:55:20	2:55:40	20	1130
Primary	248	-10.2	7.2	3:46:53	3:47:13	20	474
Secondary	249	21.0	-13.6	3:53:10	3:53:40	30	1564
Secondary	250	21.0	-13.6	3:55:10	3:55:20	10	814

Table B-4. Same as Table B-1 but for air samples taken during Eruption 4.

Sampler	Bag #	Start	End	Sample time (s)	Exposure time (s)	CO ₂ (ppm)
50m1	132	4:25:20	4:33:20	480	777	3308
50m2	131	4:25:20	4:33:20	480	789	4303
50m3	127	4:25:20	4:33:20	480	787	1921
50m4	129	4:25:20	4:33:20	480	789	1291
50m5	130	4:25:20	4:33:20	480	789	1171
75m1	123	4:25:20	4:33:20	480	754	1752
75m2	122	4:25:20	4:33:20	480	753	n/a
75m3	121	4:25:20	4:33:20	480	753	951
75m4	128	4:25:20	4:33:20	480	751	968
100m1	124	4:25:20	4:33:20	480	713	833
100m2	125	4:25:20	4:33:20	480	717	701
100m3	126	4:25:20	4:33:20	480	716	634

Table B-5. Same as Table B-1 but for air samples taken during pre-eruption emissions of Eruption 5.

Sampler	Bag #	Start	End	Sample time (s)	Exposure time (s)	CO ₂ (ppm)
25m1	106	9:45:00	9:58:40	820	820	n/a
25m2	55	9:45:00	9:58:40	820	820	686
25m3	64	9:45:00	9:58:40	820	820	478
50m1	66	9:45:00	9:58:40	820	820	467
50m2	65	9:45:00	9:58:40	820	820	502
50m3	140	9:49:10	9:58:40	570	790	425
50m4	139	9:49:35	9:58:40	545	791	420
50m5	136	9:49:35	9:58:40	545	791	398
75m1	69	9:45:00	9:58:40	820	820	n/a
75m2	68	9:45:00	9:58:40	820	820	422
75m3	67	9:45:00	9:58:40	820	820	426
75m4	72	9:45:00	9:58:40	820	820	417
100m1	73	9:45:00	9:58:40	820	820	429
100m2	107	9:45:00	9:58:40	820	820	412
100m3	108	9:47:00	9:58:40	700	761	404

Table B-6. Same as Table B-1 but for air samples taken during Eruption 5 with the Blue Box sampler.

Bag #	Start	End	Sample time (s)	Exposure time (s)	CO ₂ (ppm)
254	10:43:00	10:43:20	20	130	7943
251	10:43:40	10:44:00	20	40	4887
252	10:44:20	10:44:40	20	40	5900
253	10:45:00	10:45:20	20	40	11587
169	10:45:40	10:46:00	20	40	6659
170	10:46:20	10:46:40	20	40	5314
171	10:47:00	10:47:20	20	40	4590
172	10:47:40	10:48:00	20	40	1096
173	10:48:20	10:48:40	20	40	3832
174	10:49:00	10:49:20	20	40	5835
175	10:49:40	10:50:00	20	40	1351
176	10:50:20	10:50:40	20	40	3313
177	10:51:00	10:51:20	20	40	5608
178	10:51:40	10:52:00	20	40	7421
179	10:52:20	10:52:40	20	40	5286
180	10:53:00	10:53:20	20	40	7278
181	10:53:40	10:54:00	20	40	2389
182	10:54:20	10:54:40	20	40	5927
183	10:55:00	10:55:20	20	40	4886
160	10:55:40	10:56:00	20	40	4900
161	10:56:20	10:56:40	20	40	10049
162	10:57:00	10:57:20	20	60	3928
157	10:58:00	10:58:20	20	60	3453
158	10:59:00	10:59:20	20	60	5496
159	11:00:00	11:00:20	20	60	6743
154	11:01:00	11:01:20	20	60	1337
155	11:02:00	11:02:20	20	60	6505
156	11:03:00	11:03:20	20	60	714
151	11:04:00	11:04:20	20	60	750
152	11:05:00	11:05:20	20	60	484
153	11:06:00	11:06:20	20	20	423

Table B-7. Information from miscellaneous air samples. All samples were taken over a 20-second period.

Location	Bag #	Date	Start	CO₂ (ppm)
Upwind of primary after E1	011	10/14	5:55:00	374
During E3, 3.0 m from primary (Photo G-2)	074	10/15	7:18:44	442
During E3, 6 cm from secondary	090	10/15	7:30:00	119600
50 m arc, after E3	137	10/15	9:02:15	374
75 m arc, after E3	134	10/15	9:03:40	363
100 m arc, after E3	133	10/15	9:05:00	362
Inside Crystal geyser pipe during minor emission before E4	144	10/15	15:59:26	39600

Appendix C –Exposure

Table C-1. Summary of crosswind off-centerline distance (y) in meters, exposure (χ) in $\text{gm}\cdot\text{s}/\text{m}^3$, for all the eruptions (E) sampled during this study. The arc and location (Loc) are also noted. The result of the Gaussian model (Gauss χ) with the same units as exposure is included for each location.

E	Arc	Loc	y	χ	Gauss χ	E	Arc	Loc	y	χ	Gauss χ
1	50	1	-1	2620	2790	4	75	1	-17	1820	1370
1	50	2	7	3030	2690	4	75	3	18	774	1300
1	50	3	15	2140	2340	4	75	4	31	799	743
1	50	4	25	1520	1690	4	100	1	-5	610	559
1	50	5	32	1360	1210	4	100	2	10	443	513
1	75	1	-57	185	177	4	100	3	22	353	338
1	75	2	-45	395	425	5*	25	2	2	432	433
1	75	3	-33	887	867	5*	25	3	15	144	143
1	100	1	-103	15.9	13.4	5*	50	1	-8	134	147
1	100	2	-98	16.7	20.5	5*	50	2	7	182	151
3	50	1	-6	73100	77800	5*	50	3	15	74.5	116
3	50	2	2	91700	83200	5*	50	4	25	68.1	63.0
3	50	3	10	61100	69400	5*	50	5	32	39.3	34.1
3	50	4	20	32900	36900	5*	75	2	8	73.3	75.6
3	50	5	28	21100	17800	5*	75	3	18	75.8	72.4
3	75	1	-17	20800	18600	5*	75	4	31	64.1	65.3
3	75	2	0	23000	23300	5*	100	1	-5	82.8	75.7
3	75	3	10	20600	21300	5*	100	2	10	59.7	69.5
3	75	4	23	13700	14800	5*	100	3	23	47.1	44.9
3	100	1	-16	10400	10600	5	30	1	0	10800	10800
4	50	1	-8	3860	4250						
4	50	2	7	5240	4390						
4	50	3	15	2060	3200						
4	50	4	25	1230	1540						
4	50	5	32	1070	735						

Appendix D – Meteorological measurements

Table D-1. Meteorological measurements. Time is MDT of the end of the measurement, WS is speed in m/s, WD is wind direction in degrees, $\sigma\theta$ is sigma theta in degrees, σU is the standard deviation of wind speed in m/s, RH is relative humidity in percent of saturation, T is dry air temperature in Celsius. Data taken during the eruptions is in **bold**.

Time	WS	WD	$\sigma\theta$	σU	RH	T	Time	WS	WD	$\sigma\theta$	σU	RH	T
10/14/04 15:35	0.9	304	57	1.7	14	21.2	10/14/04 19:15	0.6	37	15	0.9	19	17.5
10/14/04 15:40	2.2	130	28	3.7	14	21.0	10/14/04 19:20	0.5	275	66	1.1	33	17.5
10/14/04 15:45	1.1	150	27	2.5	14	20.8	10/14/04 19:25	0.5	22	53	1.0	37	16.1
10/14/04 15:50	1.5	223	26	2.5	15	20.8	10/14/04 19:30	0.4	331	22	0.7	23	16.2
10/14/04 15:55	1.4	236	15	2.1	17	20.3	10/14/04 19:35	0.4	212	35	0.6	29	16.2
10/14/04 16:00	1.7	258	26	3.1	16	20.3	10/14/04 19:40	0.3	203	67	0.7	30	15.9
10/14/04 16:05	1.0	229	55	2.4	17	20.7	10/14/04 19:45	0.3	269	70	0.6	46	15.3
10/14/04 16:10	2.0	186	25	3.3	15	20.8	10/14/04 19:50	0.3	317	40	0.4	36	14.9
10/14/04 16:15	2.0	204	10	2.8	15	20.7	10/14/04 19:55	0.2	346	42	0.4	39	14.9
10/14/04 16:20	1.3	223	15	2.1	15	20.7	10/14/04 20:00	0.5	288	21	1.2	39	14.8
10/14/04 16:25	1.0	213	19	1.6	14	21.1	10/14/04 20:05	0.4	197	47	0.8	60	14.3
10/14/04 16:30	1.4	196	17	2.3	14	21.2	10/14/04 20:10	0.4	254	33	0.8	56	13.7
10/14/04 16:35	1.3	221	37	2.8	14	21.0	10/14/04 20:15	0.3	217	40	0.7	54	13.4
10/14/04 16:40	1.0	235	27	1.8	17	21.5	10/14/04 20:20	0.5	185	30	0.8	56	13.3
10/14/04 16:45	0.9	189	30	1.6	15	21.6	10/14/04 20:25	0.8	140	26	1.2	45	13.5
10/14/04 16:50	1.0	205	45	1.9	15	21.7	10/14/04 20:30	0.4	38	28	0.7	34	14.2
10/14/04 16:55	0.6	259	30	1.4	15	21.5	10/14/04 20:35	0.4	348	43	0.7	31	14.8
10/14/04 17:00	0.7	252	14	1.1	16	22.0	10/14/04 20:40	0.4	307	36	0.9	55	14.4
10/14/04 17:05	0.4	242	53	0.9	15	22.3	10/14/04 20:45	0.5	11	72	1.0	54	13.6
10/14/04 17:10	0.3	58	71	0.9	13	22.8	10/14/04 20:50	0.5	121	39	1.7	45	13.5
10/14/04 17:15	1.4	204	14	2.1	14	22.5	10/14/04 20:55	1.3	120	20	2.1	26	14.5
10/14/04 17:20	1.1	158	33	2.3	14	21.6	10/14/04 21:00	0.9	91	70	1.6	23	15.2
10/14/04 17:25	0.8	156	54	2.1	15	21.5	10/14/04 21:05	0.9	308	19	1.4	31	14.5
10/14/04 17:30	1.1	154	19	2.1	15	21.9	10/14/04 21:10	0.4	329	39	0.8	37	13.8
10/14/04 17:35	0.7	204	66	1.7	14	22.0	10/14/04 21:15	0.6	337	24	0.9	38	13.4
10/14/04 17:40	1.0	225	44	2.2	18	22.0	10/14/04 21:20	0.7	120	42	1.7	28	13.5
10/14/04 17:45	1.1	197	13	1.8	15	21.7	10/14/04 21:25	0.7	149	65	1.4	26	14.2
10/14/04 17:50	1.2	228	23	2.2	16	21.3	10/14/04 21:30	0.4	12	51	1.0	34	13.7
10/14/04 17:55	1.3	215	16	2.6	17	21.1	10/14/04 21:35	0.7	306	40	1.1	35	13.4
10/14/04 18:00	1.1	251	24	1.8	19	20.8	10/14/04 21:40	0.3	270	68	0.7	41	13.0
10/14/04 18:05	1.1	282	17	2.0	17	21.1	10/14/04 21:45	0.3	3	100	0.9	38	12.7
10/14/04 18:10	1.5	228	20	2.2	17	20.8	10/14/04 21:50	0.6	219	29	0.9	38	12.4
10/14/04 18:15	1.1	235	22	1.8	17	20.6	10/14/04 21:55	0.3	189	49	0.9	34	12.0
10/14/04 18:20	0.8	240	14	1.9	21	20.5	10/14/04 22:00	0.7	193	16	1.1	37	11.6
10/14/04 18:25	0.9	282	12	1.6	20	20.2	10/14/04 22:05	0.6	180	14	0.9	33	11.2
10/14/04 18:30	0.8	283	17	1.9	21	19.7	10/14/04 22:10	1.0	152	8	1.6	30	10.9
10/14/04 18:35	0.6	297	23	1.3	21	19.1	10/14/04 22:15	1.4	145	6	1.8	29	10.8
10/14/04 18:40	0.8	313	12	1.4	18	18.9	10/14/04 22:20	1.1	145	6	1.4	29	11.0
10/14/04 18:45	0.7	312	16	1.1	19	18.9	10/14/04 22:25	1.0	150	11	1.4	31	11.1
10/14/04 18:50	0.7	327	11	1.2	19	18.7	10/14/04 22:30	0.9	168	15	1.2	31	10.8
10/14/04 18:55	1.0	308	18	1.4	18	18.7	10/14/04 22:35	1.3	148	6	1.6	33	10.6
10/14/04 19:00	0.9	313	10	1.4	22	18.1	10/14/04 22:40	1.5	145	8	1.8	32	10.5
10/14/04 19:05	1.0	300	15	1.3	21	17.8	10/14/04 22:45	1.4	142	8	1.8	32	10.4
10/14/04 19:10	0.2	321	41	0.6	26	17.5							continued

Time	WS	WD	$\sigma\theta$	σU	RH	T
10/14/04 22:50	1.4	149	4	1.6	34	10.2
10/14/04 22:55	1.4	153	4	1.6	34	10.1
10/14/04 23:00	0.7	165	23	1.2	37	9.9
10/14/04 23:05	0.3	185	79	0.7	41	9.7
10/14/04 23:10	0.7	145	12	1.3	36	9.6
10/14/04 23:15	1.1	150	11	1.4	36	9.6
10/14/04 23:20	1.2	162	8	1.4	34	9.3
10/14/04 23:25	0.9	179	18	1.6	39	8.9
10/14/04 23:30	0.3	335	36	0.6	46	8.8
10/14/04 23:35	0.2	272	65	0.5	45	8.8
10/14/04 23:40	0.6	194	8	0.8	45	8.7
10/14/04 23:45	0.5	171	12	0.8	40	8.7
10/14/04 23:50	0.4	272	47	0.8	43	8.7
10/14/04 23:55	0.6	318	12	0.9	43	8.7
10/15/04 0:00	0.7	128	64	1.4	38	8.7
10/15/04 0:05	1.3	150	3	1.6	35	8.5
10/15/04 0:10	1.6	149	9	2.7	32	8.3
10/15/04 0:15	2.2	143	5	3.0	31	8.6
10/15/04 0:20	2.2	135	7	2.7	31	8.4
10/15/04 0:25	1.7	149	7	2.3	31	8.4
10/15/04 0:30	1.4	153	6	1.7	32	8.2
10/15/04 0:35	1.6	108	10	2.3	31	8.6
10/15/04 0:40	1.2	121	27	2.1	30	9.3
10/15/04 0:45	1.2	157	8	1.5	35	8.7
10/15/04 0:50	1.1	143	8	1.4	36	8.1
10/15/04 0:55	1.4	144	9	1.9	33	8.1
10/15/04 1:00	1.4	146	7	1.9	33	7.6
10/15/04 1:05	1.6	138	16	2.1	32	8.1
10/15/04 1:10	1.0	174	18	1.6	34	8.3
10/15/04 1:15	0.5	155	21	1.4	34	7.8
10/15/04 1:20	1.2	169	9	2.0	36	7.5
10/15/04 1:25	1.0	161	15	1.7	35	7.4
10/15/04 1:30	0.4	207	38	0.9	38	7.2
10/15/04 1:35	0.6	307	43	1.1	47	7.1
10/15/04 1:40	0.4	338	30	0.8	45	7.0
10/15/04 1:45	0.3	356	54	0.6	45	7.0
10/15/04 1:50	0.3	190	31	0.8	45	6.9
10/15/04 1:55	0.4	238	53	1.0	38	6.8
10/15/04 2:00	0.7	268	64	1.8	40	6.7
10/15/04 2:05	0.7	279	59	1.5	42	6.9
10/15/04 2:10	1.0	329	14	1.5	45	6.7
10/15/04 2:15	0.7	317	36	1.7	45	6.8
10/15/04 2:20	0.4	30	34	0.8	45	7.0
10/15/04 2:25	0.6	307	30	1.2	46	7.0
10/15/04 2:30	0.3	282	70	0.9	46	6.9
10/15/04 2:35	0.8	130	42	1.4	43	6.8
10/15/04 2:40	1.3	150	13	1.9	37	6.7
10/15/04 2:45	1.1	193	15	2.3	39	6.4
10/15/04 2:50	0.4	141	46	0.8	39	6.1
10/15/04 2:55	0.6	131	56	1.3	41	6.2
10/15/04 3:00	0.6	124	87	1.2	38	6.4
10/15/04 3:05	0.4	326	13	0.6	43	6.4
10/15/04 3:10	0.4	1	62	1.3	45	6.4
10/15/04 3:15	2.3	149	8	3.3	37	6.6

Time	WS	WD	$\sigma\theta$	σU	RH	T
10/15/04 3:20	2.3	149	11	2.9	37	6.5
10/15/04 3:25	2.1	158	8	2.7	38	6.1
10/15/04 3:30	2.0	141	5	2.5	43	5.8
10/15/04 3:35	1.7	153	13	2.1	50	5.8
10/15/04 3:40	1.4	152	12	1.8	43	5.4
10/15/04 3:45	1.4	154	18	1.8	39	5.6
10/15/04 3:50	0.7	158	32	1.1	40	5.7
10/15/04 3:55	0.2	125	36	0.8	43	5.7
10/15/04 4:00	0.5	140	21	0.8	47	5.6
10/15/04 4:05	0.7	153	8	1.0	44	5.7
10/15/04 4:10	1.0	140	10	1.4	45	5.6
10/15/04 4:15	1.0	164	25	1.5	42	5.5
10/15/04 4:20	0.6	280	30	1.2	46	5.4
10/15/04 4:25	0.7	320	16	1.1	51	5.4
10/15/04 4:30	0.6	300	50	1.3	54	5.4
10/15/04 4:35	1.3	325	9	1.8	54	5.4
10/15/04 4:40	0.7	204	59	1.2	50	5.4
10/15/04 4:45	0.4	206	40	0.8	45	5.3
10/15/04 4:50	0.3	48	73	0.7	48	5.2
10/15/04 4:55	0.3	171	49	0.6	48	5.2
10/15/04 5:00	0.8	101	10	1.4	49	5.3
10/15/04 5:05	2.1	132	16	3.4	43	5.7
10/15/04 5:10	2.6	152	9	3.6	39	5.7
10/15/04 5:15	1.4	199	39	2.8	42	4.9
10/15/04 5:20	0.8	294	22	1.5	53	4.8
10/15/04 5:25	0.6	338	27	0.9	55	4.7
10/15/04 5:30	0.7	348	21	1.6	54	4.7
10/15/04 5:35	1.4	319	8	1.9	51	4.8
10/15/04 5:40	0.8	351	92	1.5	54	4.8
10/15/04 5:45	0.7	117	47	1.5	54	4.9
10/15/04 5:50	1.1	127	7	1.6	52	5.0
10/15/04 5:55	1.3	140	10	1.9	52	5.0
10/15/04 6:00	1.0	160	31	1.4	55	4.5
10/15/04 6:05	1.7	146	6	1.9	57	4.0
10/15/04 6:10	1.2	158	11	1.7	57	3.7
10/15/04 6:15	0.4	158	31	0.7	57	3.7
10/15/04 6:20	0.4	139	48	0.9	62	3.8
10/15/04 6:25	0.6	112	38	0.9	59	3.9
10/15/04 6:30	0.9	168	41	1.6	55	3.9
10/15/04 6:35	0.7	154	40	1.3	52	3.8
10/15/04 6:40	1.4	147	8	1.9	53	3.7
10/15/04 6:45	1.5	136	11	2.1	53	3.4
10/15/04 6:50	1.9	158	11	2.5	51	3.0
10/15/04 6:55	1.9	145	6	2.4	50	2.6
10/15/04 7:00	1.6	133	16	2.2	50	2.7
10/15/04 7:05	1.1	126	12	1.6	51	2.9
10/15/04 7:10	0.6	253	68	1.4	51	3.2
10/15/04 7:15	0.4	153	25	0.8	56	3.4
10/15/04 7:20	1.3	157	6	1.9	54	3.2
10/15/04 7:25	1.7	138	6	2.0	54	2.9
10/15/04 7:30	1.9	153	5	2.3	51	3.1
10/15/04 7:35	1.0	173	28	1.9	50	3.2
10/15/04 7:40	0.7	271	43	1.4	58	3.4

continued

Time	WS	WD	$\sigma\theta$	σU	RH	T
10/15/04 7:45	0.7	144	39	1.1	50	3.3
10/15/04 7:50	1.3	128	13	1.8	49	3.3
10/15/04 7:55	1.4	127	7	1.9	49	3.4
10/15/04 8:00	1.4	141	9	1.6	48	3.4
10/15/04 8:05	1.4	154	9	1.8	51	3.1
10/15/04 8:10	1.3	136	11	1.7	53	2.9
10/15/04 8:15	1.5	149	7	1.9	52	3.0
10/15/04 8:20	1.1	146	7	1.6	50	3.1
10/15/04 8:25	0.8	125	12	1.2	53	3.2
10/15/04 8:30	0.5	140	18	1.0	53	3.4
10/15/04 8:35	0.7	107	15	1.2	51	3.6
10/15/04 8:40	1.1	152	13	1.4	47	3.7
10/15/04 8:45	1.3	155	12	1.6	46	3.9
10/15/04 8:50	0.9	155	6	1.3	46	4.1
10/15/04 8:55	0.9	164	11	1.2	45	4.3
10/15/04 9:00	0.7	152	26	1.1	45	4.7
10/15/04 9:05	0.5	195	82	1.3	44	5.4
10/15/04 9:10	0.5	330	29	1.3	42	6.1
10/15/04 9:15	0.3	118	36	0.6	39	7.3
10/15/04 9:20	0.4	113	22	0.7	35	8.8
10/15/04 9:25	0.9	126	11	1.5	35	8.9
10/15/04 9:30	0.9	141	12	1.4	37	8.4
10/15/04 9:35	0.8	148	17	1.4	37	8.6
10/15/04 9:40	1.0	151	9	1.6	37	8.8
10/15/04 9:45	0.8	204	28	1.4	38	9.0
10/15/04 9:50	0.4	245	72	0.9	38	9.5
10/15/04 9:55	0.4	128	56	0.9	34	10.8
10/15/04 10:00	0.6	226	46	1.4	34	11.5
10/15/04 10:05	0.8	170	21	1.4	33	11.0
10/15/04 10:10	1.1	182	30	1.9	34	11.1
10/15/04 10:15	1.1	199	20	1.8	34	10.9
10/15/04 10:20	1.0	207	39	2.0	34	10.8
10/15/04 10:25	0.6	260	12	0.9	33	11.5
10/15/04 10:30	0.5	251	23	0.8	32	12.3
10/15/04 10:35	0.4	289	39	0.9	30	12.8
10/15/04 10:40	0.4	270	44	0.9	30	13.5
10/15/04 10:45	0.9	278	18	1.6	30	14.0
10/15/04 10:50	1.4	310	14	2.1	30	13.6
10/15/04 10:55	1.5	313	11	2.2	31	13.2
10/15/04 11:00	1.7	303	11	2.4	32	13.2
10/15/04 11:05	1.3	309	16	1.9	31	13.7
10/15/04 11:10	1.0	284	29	1.8	30	14.2
10/15/04 11:15	0.5	273	45	1.1	29	14.9
10/15/04 11:20	0.7	224	55	1.8	29	15.8
10/15/04 11:25	0.9	239	20	1.6	30	15.8
10/15/04 11:30	1.2	216	20	2.0	30	15.7
10/15/04 11:35	1.3	208	14	1.9	27	15.7
10/15/04 11:40	0.8	280	72	1.8	26	16.2
10/15/04 11:45	0.7	119	91	1.6	23	17.0
10/15/04 11:50	1.4	210	19	2.6	26	17.1
10/15/04 11:55	1.8	160	27	3.0	23	16.8
10/15/04 12:00	1.1	158	61	3.0	23	17.1
10/15/04 12:05	1.1	189	48	2.4	23	17.5
10/15/04 12:10	1.2	232	9	1.9	28	17.3

Time	WS	WD	$\sigma\theta$	σU	RH	T
10/15/04 12:15	1.2	221	13	2.3	25	17.5
10/15/04 12:20	0.8	212	37	2.0	24	17.7
10/15/04 12:25	1.1	192	33	2.3	22	18.5
10/15/04 12:30	0.9	234	27	2.0	23	18.4
10/15/04 12:35	1.2	202	20	2.0	22	18.5
10/15/04 12:40	0.8	207	42	1.6	22	18.8
10/15/04 12:45	1.0	285	37	2.1	23	19.5
10/15/04 12:50	0.8	288	60	2.2	22	19.6
10/15/04 12:55	0.7	205	48	1.6	21	20.1
10/15/04 13:00	1.0	275	13	1.7	21	20.3
10/15/04 13:05	0.9	256	21	1.3	21	20.3
10/15/04 13:10	1.2	226	20	1.8	22	19.9
10/15/04 13:15	0.8	208	23	1.5	20	20.0
10/15/04 13:20	0.9	184	27	2.1	19	20.5
10/15/04 13:25	1.0	254	31	2.0	20	20.7
10/15/04 13:30	0.9	216	24	1.5	19	20.6
10/15/04 13:35	0.9	257	18	1.4	20	21.0
10/15/04 13:40	1.0	244	7	1.4	22	20.9
10/15/04 13:45	1.1	227	31	2.2	21	21.0
10/15/04 13:50	1.2	234	32	2.1	18	21.3
10/15/04 13:55	1.2	203	20	2.0	17	21.4
10/15/04 14:00	1.4	211	14	2.3	19	21.7
10/15/04 14:05	1.7	168	41	3.4	17	21.7
10/15/04 14:10	2.0	197	12	3.5	17	21.7
10/15/04 14:15	1.2	194	27	2.3	17	21.8
10/15/04 14:20	1.0	6	92	2.3	17	22.3
10/15/04 14:25	1.1	278	24	2.1	18	22.5
10/15/04 14:30	1.0	264	35	2.2	18	22.9
10/15/04 14:35	1.4	299	20	2.4	16	22.8
10/15/04 14:40	0.7	315	17	1.3	16	23.1
10/15/04 14:45	0.8	237	31	1.8	16	23.7
10/15/04 14:50	1.2	212	23	2.1	16	23.6
10/15/04 14:55	0.6	179	63	1.5	15	24.1
10/15/04 15:00	1.1	103	52	3.4	14	24.2
10/15/04 15:05	0.7	100	76	1.5	14	24.0
10/15/04 15:10	0.5	5	63	1.4	14	24.3
10/15/04 15:15	1.3	247	19	2.4	17	24.5
10/15/04 15:20	1.4	159	18	2.4	15	23.7
10/15/04 15:25	0.6	262	66	1.9	15	24.3
10/15/04 15:30	1.0	280	92	3.2	14	25.0
10/15/04 15:35	1.2	146	31	3.4	14	24.4
10/15/04 15:40	0.7	234	54	1.4	14	24.9
10/15/04 15:45	0.8	243	42	1.3	14	25.3
10/15/04 15:50	1.0	247	16	1.6	16	25.1
10/15/04 15:55	0.9	255	12	1.3	17	24.7
10/15/04 16:00	1.1	246	13	1.4	18	24.8
10/15/04 16:05	1.0	250	12	1.8	16	24.7
10/15/04 16:10	0.9	267	29	2.3	15	25.2
10/15/04 16:15	0.9	280	47	2.1	14	25.5
10/15/04 16:20	1.1	254	12	2.1	18	25.4
10/15/04 16:25	1.9	293	34	3.9	15	25.1
10/15/04 16:30	1.9	288	37	3.5	15	24.4
10/15/04 16:35	2.0	295	15	3.2	16	24.2

continued

Time	WS	WD	$\sigma\theta$	σU	RH	T
10/15/04 16:40	1.7	299	12	2.9	15	24.3
10/15/04 16:45	1.8	291	13	2.8	16	24.7
10/15/04 16:50	2.1	279	10	2.8	16	24.3
10/15/04 16:55	1.1	236	29	2.0	15	24.3
10/15/04 17:00	1.1	291	18	1.8	15	24.5
10/15/04 17:05	0.9	271	40	1.6	16	24.7
10/15/04 17:10	1.2	285	19	2.0	15	24.7
10/15/04 17:15	1.1	272	15	1.9	16	24.9
10/15/04 17:20	0.9	270	10	1.7	15	25.3
10/15/04 17:25	0.8	289	12	1.2	14	25.2
10/15/04 17:30	0.8	275	16	1.6	14	25.3
10/15/04 17:35	0.9	296	13	1.4	15	24.8
10/15/04 17:40	0.8	291	14	1.4	16	24.8
10/15/04 17:45	0.7	289	12	1.0	16	24.6
10/15/04 17:50	0.6	261	14	1.0	15	24.7
10/15/04 17:55	0.5	239	31	0.9	23	24.2
10/15/04 18:00	0.1	209	53	0.4	19	23.7
10/15/04 18:05	0.5	169	22	1.0	18	23.7
10/15/04 18:10	0.4	194	40	0.8	19	23.6
10/15/04 18:15	0.2	321	18	0.4	16	23.6
10/15/04 18:20	0.4	293	8	0.6	15	23.7
10/15/04 18:25	1.0	313	4	1.4	20	23.4
10/15/04 18:30	1.3	317	3	1.6	19	22.5
10/15/04 18:35	1.5	313	3	1.7	18	21.9
10/15/04 18:40	1.1	320	4	1.3	18	21.8
10/15/04 18:45	0.8	305	25	1.2	19	21.7
10/15/04 18:50	0.4	278	37	0.8	21	21.3
10/15/04 18:55	0.4	290	58	0.9	24	21.0
10/15/04 19:00	0.2	67	78	0.6	25	19.9
10/15/04 19:05	0.5	199	75	1.1	37	19.3
10/15/04 19:10	0.5	181	32	1.1	32	18.8
10/15/04 19:15	0.3	49	29	0.6	31	18.7
10/15/04 19:20	0.6	156	26	0.9	26	19.3
10/15/04 19:25	0.7	157	17	1.1	28	19.5
10/15/04 19:30	0.5	195	34	0.8	27	19.3
10/15/04 19:35	0.4	143	56	0.7	24	19.0
10/15/04 19:40	0.5	327	89	0.9	26	19.0
10/15/04 19:45	0.5	0	58	1.0	25	18.9
10/15/04 19:50	0.4	320	52	1.2	48	18.0
10/15/04 19:55	0.2	224	43	0.8	49	17.2
10/15/04 20:00	0.4	104	16	0.7	38	16.9
10/15/04 20:05	0.8	177	20	1.3	33	17.8
10/15/04 20:10	0.9	107	41	1.5	28	17.6
10/15/04 20:15	1.1	153	44	1.9	29	17.9
10/15/04 20:20	1.1	141	16	1.6	23	18.3
10/15/04 20:25	1.2	155	14	1.5	22	18.5
10/15/04 20:30	0.8	147	7	1.2	22	18.5
10/15/04 20:35	0.7	170	24	1.1	28	18.2
10/15/04 20:40	1.4	150	26	2.3	30	16.9
10/15/04 20:45	1.7	135	9	2.7	24	17.1
10/15/04 20:50	1.3	122	15	1.9	23	17.4
10/15/04 20:55	1.6	101	13	2.3	22	17.9
10/15/04 21:00	1.1	151	41	1.7	25	18.1
10/15/04 21:05	0.8	158	13	1.3	24	17.0

Time	WS	WD	$\sigma\theta$	σU	RH	T
10/15/04 21:10	1.4	159	10	2.0	25	17.0
10/15/04 21:15	1.1	136	27	2.1	28	15.9
10/15/04 21:20	0.4	293	59	1.1	28	15.7
10/15/04 21:25	0.6	348	89	1.1	30	15.5
10/15/04 21:30	0.9	308	11	1.2	30	15.5
10/15/04 21:35	0.9	309	18	1.3	29	15.5
10/15/04 21:40	0.5	360	44	0.9	29	15.7
10/15/04 21:45	0.5	197	45	1.1	38	15.5
10/15/04 21:50	0.5	157	22	0.9	30	15.3
10/15/04 21:55	1.3	159	9	1.9	28	15.5
10/15/04 22:00	1.6	127	11	2.4	26	15.7
10/15/04 22:05	1.8	130	18	3.0	23	16.7
10/15/04 22:10	1.9	148	21	3.4	23	16.8
10/15/04 22:15	0.9	156	44	2.6	27	16.1
10/15/04 22:20	1.7	145	47	2.7	25	15.7
10/15/04 22:25	1.6	201	89	2.6	30	15.4
10/15/04 22:30	0.9	293	78	2.0	31	15.3
10/15/04 22:35	0.8	115	41	1.9	31	14.9
10/15/04 22:40	1.8	153	25	3.5	27	15.2
10/15/04 22:45	1.6	146	32	3.6	24	16.1
10/15/04 22:50	1.2	112	87	2.9	24	17.2
10/15/04 22:55	0.5	187	76	1.7	30	15.7
10/15/04 23:00	0.7	278	55	1.8	32	15.0
10/15/04 23:05	0.5	126	85	1.7	35	14.5
10/15/04 23:10	1.2	311	15	1.7	41	14.2
10/15/04 23:15	0.7	1	35	1.7	35	13.8
10/15/04 23:20	0.6	223	52	1.2	33	14.0
10/15/04 23:25	1.0	343	63	2.0	37	13.7
10/15/04 23:30	1.0	83	54	2.1	30	13.6
10/15/04 23:35	1.3	165	25	2.6	30	14.2
10/15/04 23:40	1.6	159	9	2.8	30	13.7
10/15/04 23:45	1.2	177	80	2.6	32	13.4
10/15/04 23:50	1.1	140	70	2.4	34	13.1
10/15/04 23:55	1.0	312	11	1.6	37	12.8
10/16/04 0:00	0.6	317	21	1.9	38	12.7
10/16/04 0:05	1.1	308	12	2.1	43	12.3
10/16/04 0:10	0.9	295	11	1.4	49	12.1
10/16/04 0:15	0.5	324	42	1.4	49	12.0
10/16/04 0:20	0.6	103	51	1.5	40	12.2
10/16/04 0:25	0.5	169	48	1.0	45	12.4
10/16/04 0:30	0.5	187	44	1.1	40	12.5
10/16/04 0:35	0.3	156	15	0.5	41	12.3
10/16/04 0:40	0.4	266	59	0.8	46	12.2
10/16/04 0:45	0.3	171	47	0.5	48	12.0
10/16/04 0:50	0.9	112	24	1.8	39	12.1
10/16/04 0:55	1.5	113	29	2.1	32	13.1
10/16/04 1:00	1.3	125	35	2.6	30	13.1
10/16/04 1:05	0.8	318	46	1.8	40	12.7
10/16/04 1:10	1.8	331	9	2.4	39	11.7
10/16/04 1:15	1.0	323	24	1.9	37	11.7
10/16/04 1:20	1.0	167	26	3.0	42	11.6
10/16/04 1:25	1.2	89	49	2.5	47	10.8
10/16/04 1:30	0.5	134	69	1.0	46	10.9

continued

Time	WS	WD	$\sigma\theta$	σU	RH	T
10/16/04 1:35	0.9	137	46	1.6	48	10.7
10/16/04 1:40	1.0	136	28	1.4	40	10.9
10/16/04 1:45	0.9	181	20	1.5	45	10.5
10/16/04 1:50	1.0	174	17	1.8	44	10.3
10/16/04 1:55	1.0	143	18	1.5	45	10.1
10/16/04 2:00	1.5	146	21	2.1	39	9.8
10/16/04 2:05	1.5	158	26	2.2	35	10.3
10/16/04 2:10	1.4	139	41	2.5	39	10.0
10/16/04 2:15	1.9	120	13	2.8	34	10.5
10/16/04 2:20	1.3	135	15	1.9	33	10.6
10/16/04 2:25	0.9	244	71	1.6	38	10.5
10/16/04 2:30	0.9	198	94	1.8	42	9.9
10/16/04 2:35	1.0	134	51	2.1	35	9.9
10/16/04 2:40	1.6	305	39	2.9	42	9.6
10/16/04 2:45	1.0	318	39	2.3	42	9.8
10/16/04 2:50	1.2	317	23	2.4	44	9.7
10/16/04 2:55	0.8	311	32	1.4	44	9.6
10/16/04 3:00	0.6	295	42	1.1	46	9.6
10/16/04 3:05	0.8	274	64	1.7	51	9.5
10/16/04 3:10	1.0	322	45	1.4	52	9.3
10/16/04 3:15	0.6	94	51	1.9	44	9.6
10/16/04 3:20	2.2	135	20	4.3	40	9.9
10/16/04 3:25	3.0	132	9	4.3	32	11.0
10/16/04 3:30	2.4	135	13	4.2	30	12.2
10/16/04 3:35	2.0	146	41	3.1	31	12.0
10/16/04 3:40	1.1	312	81	2.3	37	10.9
10/16/04 3:45	2.1	131	11	3.0	43	9.5
10/16/04 3:50	1.6	132	19	3.2	44	8.8
10/16/04 3:55	1.7	151	15	2.2	43	8.9
10/16/04 4:00	1.1	115	15	1.5	43	8.8
10/16/04 4:05	0.9	154	30	1.4	42	9.0
10/16/04 4:10	1.2	148	49	2.3	39	9.2
10/16/04 4:15	1.0	293	69	2.9	44	9.3
10/16/04 4:20	0.8	257	68	1.2	40	9.4
10/16/04 4:25	0.9	156	57	1.6	48	9.2
10/16/04 4:30	0.6	176	69	1.1	44	8.6
10/16/04 4:35	0.5	141	79	0.9	46	8.3
10/16/04 4:40	0.6	148	50	0.9	49	8.2
10/16/04 4:45	0.6	105	58	1.4	47	8.2
10/16/04 4:50	1.2	149	11	1.8	45	7.9
10/16/04 4:55	1.1	145	13	1.8	47	7.4
10/16/04 5:00	1.1	148	14	1.6	47	7.3
10/16/04 5:05	0.7	146	21	1.3	46	7.3
10/16/04 5:10	1.2	130	17	1.6	44	7.5
10/16/04 5:15	1.1	150	28	1.7	41	8.1
10/16/04 5:20	1.4	147	25	1.9	41	8.0
10/16/04 5:25	0.7	168	25	1.5	51	7.7
10/16/04 5:30	1.0	154	16	1.6	53	7.2
10/16/04 5:35	0.5	131	36	1.3	57	6.9
10/16/04 5:40	0.8	123	39	1.3	56	6.9
10/16/04 5:45	1.2	127	12	1.7	54	6.8
10/16/04 5:50	1.7	155	5	2.1	51	6.7
10/16/04 5:55	1.1	160	11	1.7	51	6.1
10/16/04 6:00	0.9	143	15	1.3	50	5.8

Time	WS	WD	$\sigma\theta$	σU	RH	T
10/16/04 6:05	1.1	120	10	1.5	52	5.9
10/16/04 6:10	1.2	126	14	1.6	50	6.2
10/16/04 6:15	1.2	142	12	1.5	48	6.3
10/16/04 6:20	1.3	139	7	1.6	49	6.2
10/16/04 6:25	1.4	132	7	2.3	48	6.2
10/16/04 6:30	2.0	151	7	2.5	47	6.2
10/16/04 6:35	1.2	127	10	2.0	51	5.7
10/16/04 6:40	1.6	127	18	2.4	54	5.8
10/16/04 6:45	1.3	119	15	1.8	50	5.9
10/16/04 6:50	1.7	146	15	2.2	49	6.0
10/16/04 6:55	0.9	115	27	1.8	54	5.7
10/16/04 7:00	1.4	127	20	2.0	48	6.0
10/16/04 7:05	1.1	184	49	2.2	49	6.0
10/16/04 7:10	0.7	68	55	1.7	54	5.7
10/16/04 7:15	0.8	165	49	1.4	53	5.9
10/16/04 7:20	1.1	147	12	1.7	53	5.5
10/16/04 7:25	1.7	148	9	2.1	55	5.0
10/16/04 7:30	1.8	148	6	2.2	56	5.0
10/16/04 7:35	1.8	150	10	2.5	57	5.0
10/16/04 7:40	1.8	126	11	2.5	55	4.9
10/16/04 7:45	1.4	120	15	2.3	50	5.3
10/16/04 7:50	1.2	121	12	1.9	49	5.4
10/16/04 7:55	1.4	116	16	2.4	47	5.4
10/16/04 8:00	1.6	119	18	2.6	45	5.4
10/16/04 8:05	1.5	139	19	1.9	44	5.4
10/16/04 8:10	1.6	136	14	2.2	43	5.7
10/16/04 8:15	1.6	137	9	2.1	43	5.7
10/16/04 8:20	1.4	151	13	2.0	42	5.7
10/16/04 8:25	1.6	153	12	2.1	41	5.8
10/16/04 8:30	1.0	125	36	1.8	43	5.9
10/16/04 8:35	1.7	133	18	2.4	41	6.3
10/16/04 8:40	2.2	170	9	3.1	41	6.7
10/16/04 8:45	2.2	162	5	2.6	41	6.7
10/16/04 8:50	2.1	154	8	2.6	43	6.7
10/16/04 8:55	1.5	138	10	2.2	47	6.9
10/16/04 9:00	1.1	138	15	1.7	45	7.4
10/16/04 9:05	0.5	185	64	1.4	47	8.1
10/16/04 9:10	1.0	128	9	1.7	41	9.4
10/16/04 9:15	0.9	152	39	1.7	39	10.0
10/16/04 9:20	0.7	260	64	1.6	39	10.6
10/16/04 9:25	0.6	324	31	1.1	39	10.7
10/16/04 9:30	2.3	132	31	4.2	34	11.8
10/16/04 9:35	2.8	141	8	4.3	31	12.8
10/16/04 9:40	2.7	139	10	3.9	30	13.2
10/16/04 9:45	2.5	143	10	3.6	30	13.6
10/16/04 9:50	2.3	142	11	3.4	29	14.0
10/16/04 9:55	1.5	152	17	2.4	29	14.5
10/16/04 10:00	1.1	148	36	2.6	28	15.3
10/16/04 10:05	1.9	145	22	4.2	27	15.7
10/16/04 10:10	1.5	184	24	3.2	28	15.8
10/16/04 10:15	1.0	207	27	2.1	30	15.6
10/16/04 10:20	1.1	326	30	2.5	31	16.0
10/16/04 10:25	1.7	316	14	2.5	31	15.6

continued

Time	WS	WD	$\sigma\theta$	σU	RH	T
10/16/04 10:30	1.2	316	20	2.2	30	15.6
10/16/04 10:35	1.1	287	28	1.9	29	16.4
10/16/04 10:40	1.6	299	19	2.4	30	16.4
10/16/04 10:45	1.9	328	14	2.9	31	16.2
10/16/04 10:50	2.3	320	11	3.5	29	16.3
10/16/04 10:55	2.6	327	13	3.7	28	16.4
10/16/04 11:00	1.9	311	8	2.8	28	16.5
10/16/04 11:05	1.2	306	19	2.2	28	16.9
10/16/04 11:10	0.5	278	29	0.9	28	18.0
10/16/04 11:15	0.6	216	61	1.4	24	19.2
10/16/04 11:20	0.6	264	53	1.2	24	19.8
10/16/04 11:25	0.7	241	16	1.1	24	19.8
10/16/04 11:30	0.9	220	26	2.1	24	19.8
10/16/04 11:35	0.9	219	27	1.9	21	20.1
10/16/04 11:40	1.2	222	21	3.1	22	20.3
10/16/04 11:45	2.7	146	20	4.0	19	20.6
10/16/04 11:50	2.1	148	18	4.8	18	20.7
10/16/04 11:55	2.1	134	24	4.4	18	21.1
10/16/04 12:00	2.4	149	31	4.5	18	21.3
10/16/04 12:05	1.7	190	23	3.0	19	21.4
10/16/04 12:10	1.4	219	30	2.8	20	21.4
10/16/04 12:15	1.6	162	27	3.0	17	21.9
10/16/04 12:20	1.3	170	26	3.0	17	22.4
10/16/04 12:25	1.8	177	32	3.6	17	22.5
10/16/04 12:30	1.1	173	69	3.4	16	22.5
10/16/04 12:35	1.8	161	29	3.1	16	22.8
10/16/04 12:40	1.6	163	16	2.9	15	22.6
10/16/04 12:45	1.5	198	47	3.4	16	22.7
10/16/04 12:50	0.6	214	55	1.7	16	23.4
10/16/04 12:55	0.8	262	32	1.6	16	23.6
10/16/04 13:00	1.1	217	43	2.6	16	23.6
10/16/04 13:05	0.7	300	26	1.6	15	23.9
10/16/04 13:10	1.5	241	16	3.0	17	23.6
10/16/04 13:15	1.3	228	30	2.7	18	23.5
10/16/04 13:20	1.4	132	35	2.4	14	23.4
10/16/04 13:25	0.8	216	80	2.5	14	23.9
10/16/04 13:30	1.0	100	68	2.5	13	24.3
10/16/04 13:35	1.0	130	40	1.8	14	24.0
10/16/04 13:40	1.0	273	37	2.3	14	24.3
10/16/04 13:45	1.0	251	78	2.2	15	24.3
10/16/04 13:50	0.8	129	82	1.6	13	24.5
10/16/04 13:55	0.8	286	33	1.6	14	24.7

Appendix E – Temperature measurements

Table E-1. Temperature measurements. Time is MDT of the end of the measurement in Celsius. Data taken during the eruptions is in **bold**. Data removed due to sensor movement is noted with "rem".

Time	T1	T2	T3	Time	T1	T2	T3	Time	T1	T2	T3
10/14/2004				10/14/2004				10/14/2004			
18:14	19.92	16.45	15.89	18:59	17.01	16.78	16.20	19:44	16.77	16.78	16.87
18:15	18.88	16.49	15.94	19:00	17.00	16.74	16.08	19:45	16.73	16.82	16.90
18:16	18.37	16.53	16.44	19:01	16.99	16.77	15.93	19:46	16.74	16.82	16.94
18:17	18.05	16.57	16.93	19:02	16.98	16.77	15.81	19:47	16.77	16.86	16.97
18:18	17.79	16.58	17.19	19:03	16.96	16.79	15.74	19:48	16.76	16.89	16.97
18:19	17.58	16.59	17.31	19:04	16.82	16.78	15.71	19:49	16.82	16.90	16.93
18:20	17.46	16.60	17.41	19:05	16.85	16.72	15.56	19:50	16.68	16.81	16.86
18:21	17.33	16.57	17.47	19:06	16.54	16.72	15.49	19:51	16.62	16.76	16.85
18:22	17.22	16.54	17.44	19:07	16.64	16.71	15.45	19:52	16.60	16.77	16.90
18:23	17.14	16.53	17.42	19:08	16.57	16.72	15.37	19:53	16.65	16.80	16.94
18:24	17.03	16.54	17.40	19:09	16.73	16.72	15.27	19:54	16.66	16.82	16.91
18:25	17.05	16.51	17.43	19:10	16.68	16.75	15.39	19:55	16.51	16.68	16.81
18:26	16.97	16.48	17.42	19:11	16.71	16.74	15.55	19:56	16.51	16.69	16.83
18:27	16.94	16.51	17.42	19:12	16.65	16.79	15.80	19:57	16.51	16.73	16.86
18:28	16.89	16.50	17.38	19:13	16.68	16.80	15.89	19:58	16.63	16.75	16.91
18:29	16.81	16.51	17.30	19:14	16.68	16.80	16.02	19:59	16.61	16.72	16.85
18:30	16.76	16.53	17.27	19:15	16.78	16.84	16.12	20:00	16.63	16.75	16.85
18:31	16.70	16.48	17.25	19:16	16.89	16.91	16.26	20:01	16.58	16.69	16.75
18:32	16.66	16.35	17.22	19:17	16.91	16.93	16.47	20:02	16.55	16.70	16.81
18:33	16.61	16.27	17.16	19:18	16.88	16.89	16.53	20:03	16.51	16.74	16.86
18:34	16.58	16.28	17.11	19:19	16.86	16.91	16.58	20:04	16.58	16.81	16.92
18:35	16.60	16.31	17.10	19:20	16.86	16.95	16.73	20:05	16.60	16.78	16.88
18:36	16.72	16.31	17.12	19:21	16.91	16.95	16.83	20:06	16.55	16.82	16.93
18:37	16.81	16.33	17.12	19:22	16.95	16.98	16.91	20:07	16.75	16.86	16.97
18:38	16.86	16.35	17.12	19:23	16.95	16.96	16.92	20:08	16.93	16.80	17.04
18:39	16.89	16.38	17.14	19:24	16.95	16.97	16.96	20:09	16.96	16.73	17.00
18:40	16.92	16.43	17.11	19:25	16.95	16.96	16.97	20:10	16.65	16.66	16.60
18:41	16.88	16.70	17.07	19:26	16.89	16.93	16.98	20:11	16.60	16.56	16.52
18:42	16.76	16.86	17.04	19:27	16.87	16.92	17.00	20:12	16.53	16.48	16.47
18:43	16.66	16.91	16.98	19:28	16.89	16.93	17.01	20:13	16.65	16.57	16.57
18:44	16.49	16.94	16.90	19:29	16.93	16.94	17.01	20:14	16.67	16.61	16.65
18:45	16.36	16.95	16.81	19:30	16.90	16.94	17.01	20:15	16.67	16.70	16.77
18:46	16.34	17.00	16.77	19:31	16.86	16.93	17.01	20:16	16.71	16.78	16.87
18:47	16.29	17.09	16.72	19:32	16.90	16.95	17.01	20:17	16.79	16.84	16.95
18:48	16.49	17.11	16.68	19:33	16.88	16.93	17.00	20:18	17.00	16.86	17.07
18:49	16.51	17.06	16.65	19:34	16.87	16.95	17.02	20:19	17.09	16.75	17.07
18:50	16.44	17.02	16.61	19:35	17.00	16.97	17.07	20:20	16.84	16.75	16.81
18:51	16.43	16.93	16.59	19:36	16.82	16.79	16.85	20:21	16.74	16.70	16.64
18:52	16.44	16.90	16.56	19:37	16.60	16.65	16.59	20:22	16.71	16.69	16.64
18:53	16.37	16.86	16.50	19:38	16.51	16.55	16.54	20:23	16.71	16.66	16.65
18:54	16.31	16.97	16.44	19:39	16.53	16.52	16.57	20:24	16.74	16.65	16.69
18:55	16.50	16.97	16.38	19:40	16.62	16.57	16.61	20:25	16.77	16.68	16.75
18:56	16.73	16.96	16.34	19:41	16.71	16.64	16.67	20:26	16.79	16.78	16.84
18:57	16.92	16.91	16.34	19:42	16.71	16.68	16.73	20:27	16.80	16.85	16.90
18:58	17.04	16.86	16.30	19:43	16.80	16.71	16.80				continued

Time	T1	T2	T3
10/14/2004			
20:28	16.85	16.89	16.95
20:29	16.97	16.91	17.03
20:30	17.10	16.83	17.12
20:31	17.05	16.82	17.03
20:32	16.86	16.80	16.78
20:33	16.77	16.78	16.69
20:34	16.78	16.77	16.70
20:35	16.78	16.75	16.70
20:36	16.78	16.72	16.70
20:37	16.77	16.71	16.71
20:38	16.77	16.68	16.74
20:39	16.79	16.68	16.79
20:40	16.83	16.82	16.89
20:41	16.90	16.91	16.98
20:42	17.08	16.87	17.10
20:43	17.09	16.82	17.08
20:44	16.98	16.84	16.98
20:45	16.96	16.85	16.98
20:46	16.98	16.86	17.00
20:47	17.13	16.86	17.09
20:48	17.14	16.89	17.10
20:49	17.11	16.92	17.08
20:50	17.10	16.94	17.06
20:51	17.11	16.95	17.07
20:52	17.16	16.95	17.11
20:53	17.16	16.97	17.11
20:54	17.16	16.99	17.11
20:55	17.16	17.00	17.12
20:56	17.15	17.00	17.09
20:57	17.03	17.00	16.97
20:58	16.99	16.97	16.91
20:59	16.93	16.92	16.85
21:00	16.90	16.91	16.80
21:01	16.86	16.88	16.76
21:02	16.82	16.76	16.69
21:03	16.73	16.59	16.69
21:04	16.77	16.61	16.74
21:05	16.79	16.71	16.79
21:06	16.79	16.77	16.85
21:07	16.85	16.80	16.90
21:08	16.80	16.83	16.92
21:09	16.76	16.86	16.96
21:10	16.77	16.87	16.98
21:11	16.88	16.92	17.00
21:12	16.98	16.84	17.07
21:13	17.14	16.81	17.13
21:14	17.08	16.83	17.05
21:15	16.92	16.86	16.82
21:16	16.87	16.86	16.77
21:17	16.83	16.87	16.76
21:18	16.85	16.83	16.76
21:19	16.86	16.81	16.77

Time	T1	T2	T3
10/14/2004			
21:20	16.84	16.80	16.77
21:21	16.83	16.77	16.76
21:22	16.84	16.77	16.78
21:23	16.88	16.80	16.85
21:24	16.94	16.91	16.95
21:25	17.14	16.85	17.11
21:26	17.15	16.85	17.11
21:27	17.15	16.90	17.11
21:28	17.13	16.94	17.10
21:29	17.15	16.96	17.10
21:30	17.16	16.97	17.11
21:31	17.17	16.98	17.12
21:32	17.14	17.00	17.10
21:33	17.15	16.99	17.10
21:34	17.11	16.99	17.07
21:35	17.03	16.98	16.96
21:36	16.99	16.96	16.89
21:37	16.93	16.95	16.87
21:38	16.93	16.90	16.83
21:39	16.90	16.87	16.81
21:40	16.83	16.63	16.79
21:41	16.80	16.59	16.80
21:42	16.83	16.76	16.82
21:43	16.86	16.82	16.85
21:44	16.90	16.85	16.89
21:45	16.84	16.86	16.91
21:46	16.87	16.91	16.96
21:47	16.87	16.92	16.97
21:48	16.88	16.86	17.00
21:49	17.00	16.78	17.07
21:50	17.14	16.82	17.12
21:51	17.13	16.90	17.09
21:52	17.14	16.94	17.10
21:53	17.17	16.97	17.12
21:54	17.16	16.99	17.12
21:55	17.16	17.00	17.11
21:56	17.17	17.01	17.12
21:57	17.16	17.00	17.10
21:58	17.16	17.01	17.11
21:59	17.15	17.01	17.11
22:00	17.11	17.01	17.05
22:01	17.03	17.00	16.94
22:02	17.00	16.99	16.90
22:03	16.91	16.97	16.85
22:04	16.84	16.84	16.77
22:05	16.79	16.52	16.59
22:06	16.72	16.51	16.45
22:07	16.67	16.60	16.45
22:08	16.66	16.60	16.48
22:09	16.69	16.59	16.61
22:10	16.73	16.64	16.74
22:11	16.64	16.75	16.83

Time	T1	T2	T3
10/14/2004			
22:12	16.72	16.79	16.88
22:13	16.70	16.84	16.92
22:14	16.83	16.90	16.97
22:15	17.03	16.80	17.06
22:16	17.05	16.75	17.08
22:17	17.13	16.76	17.11
22:18	17.13	16.88	17.11
22:19	17.14	16.94	17.11
22:20	17.16	16.97	17.12
22:21	17.15	16.98	17.11
22:22	17.15	16.98	17.10
22:23	17.16	16.99	17.11
22:24	17.13	17.00	17.09
22:25	17.05	17.00	17.00
22:26	16.98	16.97	16.91
22:27	16.92	16.96	16.83
22:28	16.89	16.92	16.79
22:29	16.86	16.81	16.72
22:30	16.83	16.77	16.65
22:31	16.79	16.71	16.64
22:32	16.76	16.70	16.69
22:33	16.75	16.67	16.72
22:34	16.71	16.70	16.77
22:35	16.67	16.74	16.81
22:36	16.65	16.77	16.85
22:37	16.69	16.79	16.87
22:38	16.73	16.82	16.90
22:39	16.83	16.86	16.94
22:40	16.93	16.79	17.01
22:41	17.10	16.72	17.10
22:42	17.12	16.76	17.11
22:43	17.13	16.85	17.08
22:44	17.13	16.91	17.11
22:45	17.15	16.93	17.11
22:46	17.16	16.94	17.11
22:47	17.14	16.95	17.10
22:48	17.14	16.96	17.10
22:49	17.14	16.96	17.10
22:50	17.14	16.97	17.09
22:51	17.01	16.97	16.93
22:52	16.92	16.96	16.87
22:53	16.87	16.94	16.80
22:54	16.85	16.89	16.74
22:55	16.79	16.63	16.48
22:56	16.69	15.95	16.31
22:57	16.53	15.95	16.28
22:58	16.54	16.42	16.26
22:59	16.50	16.57	16.30
23:00	16.60	16.65	16.50
23:01	16.55	16.63	16.67
23:02	16.50	16.69	16.79

continued

Time	T1	T2	T3
10/14/2004			
23:03	16.71	16.81	16.91
23:04	16.87	16.69	17.00
23:05	16.96	16.62	17.01
23:06	17.04	16.67	17.05
23:07	17.12	16.76	17.10
23:08	17.13	16.86	17.10
23:09	17.13	16.91	17.09
23:10	17.14	16.93	17.10
23:11	17.15	16.96	17.10
23:12	17.16	16.96	17.11
23:13	17.17	16.98	17.12
23:14	17.17	16.99	17.13
23:15	17.21	17.05	17.17
23:16	17.14	16.96	17.09
23:17	17.06	16.87	17.03
23:18	17.06	16.95	17.05
23:19	17.09	17.00	16.97
23:20	17.12	17.02	16.98
23:21	17.11	16.99	16.99
23:22	17.11	17.00	16.99
23:23	17.12	17.02	17.01
23:24	17.12	17.03	17.01
23:25	17.12	17.03	17.01
23:26	17.12	17.03	17.01
23:27	17.13	17.04	17.02
23:28	17.12	17.03	17.01
23:29	17.12	17.03	17.02
23:30	17.12	17.03	17.01
23:31	17.12	17.03	17.02
23:32	17.12	17.03	17.01
23:33	17.11	17.02	17.01
23:34	17.11	17.02	17.00
23:35	17.06	17.01	16.96
23:36	16.83	16.86	15.64
23:37	14.43	15.59	12.09
23:38	11.34	14.04	9.16
23:39	9.38	12.92	7.40
23:40	8.71	12.06	6.77
23:41	8.32	11.47	6.57
23:42	7.95	11.14	6.55
23:43	7.68	11.11	6.58
23:44	7.40	11.11	6.77
23:45	7.19	10.95	7.00
23:46	7.25	10.78	7.25
23:47	7.42	10.58	7.50
23:48	7.68	10.36	7.66
23:49	7.89	10.39	7.92
23:50	7.69	10.28	7.98
23:51	7.82	10.09	7.97
23:52	7.97	10.05	7.93
23:53	8.24	9.88	8.01
23:54	8.52	9.82	8.06

Time	T1	T2	T3
10/14/2004			
23:55	8.80	9.80	8.15
23:56	8.79	9.65	8.09
23:57	8.76	9.40	7.99
23:58	8.85	9.32	7.99
23:59	8.98	9.47	8.10
10/15/2004			
0:00	9.00	9.46	8.13
0:01	8.96	9.23	8.08
0:02	8.76	9.01	7.92
0:03	8.63	8.87	7.79
0:04	8.52	8.83	7.72
0:05	8.48	8.69	7.64
0:06	8.51	8.70	7.59
0:07	8.58	8.61	7.55
0:08	8.52	8.54	7.51
0:09	8.59	8.47	7.72
0:10	8.65	8.36	7.99
0:11	8.62	8.26	8.02
0:12	8.56	8.11	7.94
0:13	8.51	8.04	7.92
0:14	8.42	7.96	7.92
0:15	8.28	7.91	7.83
0:16	8.17	7.88	7.75
0:17	8.12	7.85	7.77
0:18	8.12	7.80	7.83
0:19	8.20	7.62	7.93
0:20	8.21	7.67	8.00
0:21	8.21	7.75	7.99
0:22	8.20	7.69	7.96
0:23	8.15	7.69	7.85
0:24	8.09	7.62	7.65
0:25	8.15	7.48	7.53
0:26	8.27	7.43	7.51
0:27	8.34	7.47	7.52
0:28	8.34	7.53	7.50
0:29	8.29	7.61	7.44
0:30	8.26	7.43	7.36
0:31	8.14	7.51	7.35
0:32	8.35	7.46	7.64
0:33	8.71	7.43	8.03
0:34	8.91	7.34	8.27
0:35	9.04	7.23	8.40
0:36	9.10	7.22	8.45
0:37	9.10	7.31	8.48
0:38	9.08	7.48	8.51
0:39	8.93	7.54	8.34
0:40	8.69	7.46	7.98
0:41	8.44	7.55	7.64
0:42	8.27	7.61	7.41
0:43	8.20	7.74	7.29
0:44	8.14	7.77	7.21
0:45	8.01	7.83	7.14

Time	T1	T2	T3
10/15/2004			
0:46	7.92	7.81	7.12
0:47	7.83	7.78	7.06
0:48	7.78	7.75	7.04
0:49	7.80	7.69	7.06
0:50	7.73	7.66	6.99
0:51	7.69	7.68	6.93
0:52	7.66	7.64	6.86
0:53	7.57	7.55	6.79
0:54	7.51	7.56	6.76
0:55	7.41	7.48	6.67
0:56	7.29	7.44	6.55
0:57	7.29	7.43	6.55
0:58	7.28	7.39	6.55
0:59	7.34	7.31	6.54
1:00	7.40	7.17	6.50
1:01	7.36	7.05	6.39
1:02	7.26	7.12	6.31
1:03	7.20	7.11	6.28
1:04	7.12	7.13	6.23
1:05	7.08	7.15	6.19
1:06	7.14	7.09	6.19
1:07	7.20	7.07	6.23
1:08	7.37	7.09	6.42
1:09	7.44	7.14	6.46
1:10	7.47	7.15	6.49
1:11	7.47	7.21	6.46
1:12	7.42	7.13	6.45
1:13	7.42	6.70	6.49
1:14	7.43	6.60	6.40
1:15	7.35	6.66	6.28
1:16	7.32	6.71	6.24
1:17	7.30	6.70	6.23
1:18	7.35	6.74	6.27
1:19	7.37	6.81	6.31
1:20	7.38	6.85	6.36
1:21	7.43	6.84	6.43
1:22	7.50	6.85	6.47
1:23	7.52	6.83	6.50
1:24	7.45	6.89	6.47
1:25	7.45	6.89	6.40
1:26	7.53	6.87	6.34
1:27	7.49	6.85	6.28
1:28	7.39	6.75	6.16
1:29	7.34	6.76	6.12
1:30	7.39	6.77	6.25
1:31	7.54	6.75	6.32
1:32	7.63	6.69	6.34
1:33	7.51	6.65	6.30
1:34	7.23	6.54	6.20
1:35	7.19	6.39	6.24
1:36	7.24	6.48	6.23

continued

Time	T1	T2	T3
10/15/2004			
1:37	7.22	6.54	6.18
1:38	7.09	6.49	6.01
1:39	7.11	6.40	5.96
1:40	7.19	6.31	6.04
1:41	7.27	6.31	6.06
1:42	7.40	6.39	6.11
1:43	7.27	6.44	6.09
1:44	7.23	6.35	6.06
1:45	7.48	6.37	6.09
1:46	7.95	6.52	6.16
1:47	8.45	6.57	6.19
1:48	9.29	6.58	6.20
1:49	11.80	7.07	6.25
1:50	14.70	8.06	6.22
1:51	15.81	9.50	6.32
1:52	15.86	11.11	6.33
1:53	16.26	12.65	6.38
1:54	16.00	14.10	6.45
1:55	15.81	14.77	6.56
1:56	15.59	15.10	6.57
1:57	15.66	15.03	6.54
1:58	15.67	14.79	6.70
1:59	15.29	14.76	6.75
2:00	15.21	15.16	6.79
2:01	15.08	15.14	6.79
2:02	15.30	15.38	6.79
2:03	15.60	15.46	6.79
2:04	15.45	15.55	6.81
2:05	15.21	15.49	6.62
2:06	15.48	15.45	6.36
2:07	15.36	15.65	6.07
2:08	15.61	15.71	6.14
2:09	15.47	15.61	6.21
2:10	15.68	15.75	6.25
2:11	15.77	15.90	6.28
2:12	16.10	15.81	6.37
2:13	15.98	15.77	6.40
2:14	16.01	15.75	6.37
2:15	16.07	15.78	5.98
2:16	15.98	15.80	5.82
2:17	16.05	15.91	5.67
2:18	16.02	15.80	5.48
2:19	16.25	15.78	5.34
2:20	16.18	15.70	5.13
2:21	16.24	15.55	4.92
2:22	16.21	15.49	5.12
2:23	16.24	15.49	5.46
2:24	16.18	15.35	5.66
2:25	16.16	15.31	5.97
2:26	16.17	15.28	5.97
2:27	16.14	15.26	5.84
2:28	16.23	15.38	6.44

Time	T1	T2	T3
10/15/2004			
2:29	16.32	15.53	8.81
2:30	16.32	15.52	10.87
2:31	16.21	15.55	12.36
2:32	16.07	15.82	12.73
2:33	16.05	15.68	12.94
2:34	16.05	15.50	13.80
2:35	16.18	15.34	15.73
2:36	16.33	15.45	16.15
2:37	16.24	15.76	16.05
2:38	16.27	15.74	16.03
2:39	16.11	15.74	16.09
2:40	15.89	16.01	15.96
2:41	15.75	15.93	15.88
2:42	15.90	15.76	15.93
2:43	16.10	15.53	15.99
2:44	16.13	15.10	15.97
2:45	16.14	15.43	15.89
2:46	16.13	15.70	15.91
2:47	16.13	15.73	15.91
2:48	16.12	15.67	15.93
2:49	16.14	15.51	15.98
2:50	16.14	15.62	15.98
2:51	16.29	15.76	16.12
2:52	16.17	15.94	16.05
2:53	15.65	16.18	15.58
2:54	15.50	16.15	15.52
2:55	15.58	16.05	15.49
2:56	15.52	15.94	15.58
2:57	15.72	15.86	15.71
2:58	15.96	15.78	15.85
2:59	16.13	15.67	16.01
3:00	16.08	15.76	16.09
3:01	16.25	15.91	16.08
3:02	16.50	16.17	16.28
3:03	16.59	16.35	16.34
3:04	16.11	16.30	15.95
3:05	15.90	16.08	15.78
3:06	15.98	15.93	15.87
3:07	16.01	15.90	15.96
3:08	16.04	15.87	15.95
3:09	16.04	15.84	15.94
3:10	16.14	15.82	16.06
3:11	16.22	15.81	16.12
3:12	16.27	15.81	16.25
3:13	16.06	15.96	16.11
3:14	15.94	16.04	15.97
3:15	15.92	16.02	16.00
3:16	16.13	15.99	16.14
3:17	16.28	15.81	16.16
3:18	16.59	15.80	16.42
3:19	16.70	16.35	16.40
3:20	16.04	16.35	16.07

Time	T1	T2	T3
10/15/2004			
3:21	15.98	16.31	15.90
3:22	15.99	16.24	15.89
3:23	16.02	16.08	15.91
3:24	16.04	16.04	15.97
3:25	16.24	16.00	16.15
3:26	16.31	16.03	16.24
3:27	16.75	16.27	16.48
3:28	16.76	16.42	16.52
3:29	16.26	16.41	16.13
3:30	16.12	16.38	15.99
3:31	16.11	16.28	15.97
3:32	16.10	16.14	16.00
3:33	16.13	16.09	16.03
3:34	16.19	16.06	16.08
3:35	16.31	16.05	16.18
3:36	16.30	15.85	16.22
3:37	16.27	15.90	16.19
3:38	16.37	16.11	16.29
3:39	16.81	16.39	16.54
3:40	16.66	16.46	16.47
3:41	16.27	16.44	16.16
3:42	16.23	16.39	16.13
3:43	16.26	16.28	16.15
3:44	16.28	16.23	16.18
3:45	16.30	16.20	16.19
3:46	16.39	16.17	16.28
3:47	16.41	16.15	16.30
3:48	16.34	16.17	16.26
3:49	16.72	16.28	16.52
3:50	16.88	16.50	16.61
3:51	16.61	16.54	16.48
3:52	16.39	16.52	16.28
3:53	16.35	16.45	16.25
3:54	16.36	16.40	16.26
3:55	16.35	16.33	16.25
3:56	16.38	16.30	16.28
3:57	16.39	16.28	16.29
3:58	16.38	16.25	16.21
3:59	16.50	16.23	16.37
4:00	16.76	16.41	16.58
4:01	16.86	16.57	16.64
4:02	16.55	16.59	16.42
4:03	16.41	16.51	16.33
4:04	16.42	16.45	16.34
4:05	16.43	16.40	16.33
4:06	16.43	16.37	16.34
4:07	16.44	16.36	16.36
4:08	16.44	16.32	16.32
4:09	16.46	16.32	16.34
4:10	16.72	16.39	16.57
4:11	16.86	16.59	16.66

continued

Time	T1	T2	T3
10/15/2004			
4:12	16.87	16.65	16.72
4:13	16.95	16.72	16.76
4:14	16.95	16.75	16.78
4:15	16.93	16.76	16.79
4:16	16.98	16.79	16.81
4:17	17.00	16.79	16.83
4:18	16.96	16.81	16.82
4:19	16.83	16.79	16.72
4:20	16.72	16.78	16.62
4:21	16.70	16.76	16.53
4:22	16.57	16.35	16.30
4:23	16.52	15.54	15.28
4:24	16.43	15.47	14.59
4:25	16.41	15.48	14.83
4:26	16.46	15.60	15.42
4:27	16.53	15.69	16.03
4:28	16.57	15.78	16.38
4:29	16.60	15.85	16.48
4:30	16.61	16.00	16.49
4:31	16.63	16.38	16.53
4:32	16.88	16.63	16.68
4:33	16.92	16.73	16.72
4:34	16.96	16.78	16.78
4:35	17.01	16.81	16.82
4:36	17.03	16.83	16.84
4:37	17.03	16.86	16.86
4:38	17.03	16.87	16.89
4:39	17.03	16.87	16.89
4:40	17.04	16.87	16.89
4:41	17.02	16.84	16.88
4:42	16.96	16.87	16.84
4:43	16.82	16.78	16.73
4:44	16.78	16.64	16.69
4:45	16.71	16.63	14.85
4:46	16.66	16.66	9.15
4:47	16.66	16.52	6.60
4:48	16.55	16.35	5.51
4:49	16.52	16.33	5.27
4:50	16.56	16.30	5.31
4:51	16.61	16.29	5.36
4:52	16.61	16.37	6.04
4:53	16.50	16.36	7.21
4:54	16.52	16.33	11.54
4:55	16.62	16.43	15.19
4:56	16.57	16.50	16.00
4:57	16.77	16.56	16.64
4:58	16.94	16.73	16.74
4:59	16.99	16.79	16.77
5:00	17.01	16.83	16.84
5:01	17.03	16.85	16.86
5:02	17.04	16.86	16.89
5:03	17.05	16.87	16.90

Time	T1	T2	T3
10/15/2004			
5:04	17.02	16.88	16.89
5:05	16.87	16.83	16.78
5:06	16.78	16.80	16.71
5:07	16.72	16.55	16.60
5:08	16.66	16.14	15.65
5:09	16.47	16.12	11.70
5:10	16.33	16.08	9.47
5:11	16.36	16.16	8.92
5:12	16.43	16.24	9.48
5:13	16.47	16.20	10.56
5:14	16.44	16.25	11.98
5:15	16.42	16.26	13.47
5:16	16.47	16.27	15.70
5:17	16.56	16.43	16.46
5:18	16.49	16.54	16.43
5:19	16.89	16.63	16.63
5:20	16.91	16.73	16.69
5:21	16.99	16.79	16.80
5:22	17.03	16.82	16.85
5:23	17.03	16.83	16.86
5:24	17.03	16.86	16.88
5:25	17.04	16.87	16.89
5:26	17.04	16.88	16.90
5:27	17.04	16.88	16.88
5:28	17.01	16.88	16.87
5:29	16.86	16.83	16.76
5:30	16.81	16.81	16.68
5:31	16.76	16.63	13.53
5:32	16.74	15.85	7.34
5:33	16.69	15.58	5.25
5:34	16.59	15.67	4.71
5:35	16.55	15.81	4.89
5:36	16.52	15.93	5.03
5:37	16.59	16.14	4.99
5:38	16.59	16.31	5.10
5:39	16.53	16.35	5.52
5:40	16.50	16.43	6.37
5:41	16.76	16.60	14.10
5:42	16.79	16.63	16.55
5:43	16.96	16.67	16.72
5:44	16.98	16.79	16.77
5:45	17.01	16.84	16.85
5:46	17.02	16.85	16.87
5:47	17.05	16.86	16.89
5:48	17.06	16.88	16.91
5:49	17.05	16.89	16.91
5:50	17.05	16.89	16.91
5:51	17.06	16.90	16.91
5:52	17.04	16.88	16.91
5:53	16.91	16.90	16.80
5:54	16.84	16.81	16.72
5:55	16.77	16.48	15.64

Time	T1	T2	T3
10/15/2004			
5:56	16.63	16.42	10.20
5:57	16.52	16.39	7.04
5:58	16.46	16.33	5.97
5:59	16.44	16.10	5.43
6:00	16.42	15.95	4.99
6:01	16.44	15.99	4.70
6:02	16.43	16.03	4.49
6:03	16.47	16.12	4.32
6:04	16.45	16.14	4.26
6:05	16.48	16.27	4.20
6:06	16.54	16.37	4.68
6:07	16.76	16.53	14.36
6:08	16.99	16.70	16.62
6:09	16.98	16.76	16.74
6:10	16.99	16.80	16.81
6:11	17.02	16.82	16.85
6:12	17.03	16.83	16.87
6:13	17.06	16.87	16.89
6:14	17.05	16.90	16.91
6:15	17.05	16.90	16.91
6:16	17.04	16.89	16.91
6:17	17.06	16.90	16.92
6:18	17.12	16.92	16.95
6:19	17.10	16.87	16.93
6:20	17.04	16.79	16.85
6:21	17.04	16.82	16.88
6:22	17.07	16.89	16.92
6:23	17.08	16.94	16.95
6:24	17.09	16.98	16.97
6:25	17.10	16.99	16.98
6:26	17.10	17.00	16.98
6:27	17.11	17.00	16.99
6:28	17.11	17.01	16.99
6:29	17.12	17.01	16.99
6:30	17.11	17.01	16.99
6:31	17.10	17.01	16.99
6:32	17.11	17.01	16.99
6:33	17.11	17.00	16.98
6:34	17.10	17.00	16.99
6:35	17.10	17.00	16.99
6:36	17.10	17.00	16.98
6:37	17.10	17.00	16.98
6:38	17.10	17.00	16.98
6:39	17.09	17.00	16.98
6:40	17.09	16.99	16.97
6:41	17.09	16.99	16.97
6:42	17.09	16.99	16.97
6:43	17.08	16.97	16.96
6:44	17.08	16.97	16.96
6:45	17.07	16.96	16.95
6:46	17.06	16.95	16.93

continued

Time	T1	T2	T3
10/15/2004			
6:47	17.05	16.94	16.93
6:48	17.04	16.94	16.92
6:49	17.05	16.92	16.91
6:50	17.03	16.90	16.90
6:51	17.03	16.89	16.88
6:52	17.01	16.88	16.87
6:53	17.00	16.86	16.86
6:54	16.98	16.84	16.84
6:55	16.97	16.84	16.84
6:56	16.96	16.82	16.82
6:57	16.94	16.80	16.81
6:58	16.93	16.79	16.80
6:59	16.92	16.78	16.78
7:00	16.91	16.77	16.77
7:01	16.89	16.75	16.75
7:02	16.88	16.73	16.74
7:03	16.86	16.71	16.72
7:04	16.85	16.71	16.71
7:05	16.85	16.70	16.71
7:06	16.84	16.68	16.69
7:07	16.82	16.65	16.67
7:08	16.80	16.65	16.66
7:09	16.79	16.64	16.65
7:10	16.78	16.62	16.64
7:11	16.77	16.62	16.63
7:12	16.76	16.62	16.63
7:13	16.77	16.61	16.62
7:14	16.76	16.61	16.61
7:15	16.75	16.60	16.61
7:16	16.74	16.60	16.61
7:17	16.75	16.60	16.60
7:18	16.74	16.60	16.60
7:19	16.74	16.60	16.60
7:20	16.74	16.59	16.60
7:21	16.74	16.59	16.60
7:22	16.73	16.58	16.59
7:23	16.73	16.59	16.59
7:24	16.73	16.59	16.59
7:25	16.73	16.59	16.59
7:26	16.73	16.59	16.59
7:27	16.73	16.58	16.59
7:28	16.72	16.58	16.58
7:29	16.72	16.58	16.58
7:30	16.71	16.58	16.58
7:31	16.71	16.58	16.58
7:32	16.71	16.59	16.58
7:33	16.70	16.57	16.57
7:34	16.70	16.57	16.58
7:35	16.69	16.56	16.56
7:36	16.70	16.56	16.56
7:37	16.69	16.57	16.57
7:38	16.69	16.56	16.57

Time	T1	T2	T3
10/15/2004			
7:39	16.69	16.57	16.57
7:40	16.69	16.57	16.57
7:41	16.69	16.57	16.57
7:42	16.69	16.57	16.57
7:43	16.69	16.58	16.57
7:44	16.70	16.58	16.58
7:45	16.70	16.58	16.57
7:46	16.70	16.57	16.57
7:47	16.69	16.58	16.57
7:48	16.69	16.59	16.57
7:49	16.70	16.59	16.58
7:50	16.70	16.59	16.58
7:51	16.70	16.59	16.58
7:52	16.70	16.59	16.58
7:53	16.69	16.59	16.58
7:54	16.70	16.58	16.58
7:55	16.70	16.59	16.58
7:56	16.70	16.59	16.58
7:57	16.70	16.59	16.58
7:58	16.70	16.59	16.58
7:59	16.70	16.59	16.58
8:00	16.70	16.59	16.58
8:01	16.70	16.59	16.58
8:02	16.70	16.60	16.58
8:03	16.70	16.60	16.59
8:04	16.71	16.60	16.59
8:05	16.71	16.60	16.59
8:06	16.71	16.60	16.59
8:07	16.71	16.60	16.59
8:08	16.71	16.60	16.59
8:09	16.71	16.60	16.59
8:10	16.71	16.61	16.60
8:11	16.72	16.61	16.60
8:12	16.71	16.62	16.60
8:13	16.72	16.61	16.60
8:14	16.72	16.62	16.60
8:15	16.72	16.62	16.61
8:16	16.73	16.61	16.61
8:17	16.72	16.61	16.60
8:18	16.71	16.61	16.60
8:19	16.71	16.61	16.60
8:20	16.66	16.60	16.51
8:21	16.03	16.25	12.32
8:22	11.99	12.89	6.68
8:23	9.27	11.69	3.85
8:24	9.02	10.90	5.30
8:25	6.39	10.02	4.17
8:26	4.06	9.13	2.89
8:27	3.06	8.64	2.11
8:28	4.87	8.55	3.51
8:29	4.86	8.53	3.71
8:30	3.23	8.01	2.66

Time	T1	T2	T3
10/15/2004			
8:31	2.40	7.84	2.00
8:32	2.00	7.72	1.65
8:33	2.83	7.70	1.95
8:34	3.96	7.47	2.15
8:35	2.62	7.22	1.47
8:36	2.11	6.97	1.20
8:37	2.67	6.95	1.28
8:38	3.59	7.18	1.42
8:39	4.51	7.21	1.53
8:40	4.94	6.99	1.63
8:41	6.36	6.78	2.78
8:42	4.58	6.63	2.10
8:43	4.92	6.60	1.91
8:44	6.56	6.72	1.89
8:45	7.21	6.69	1.83
8:46	6.87	6.71	2.17
8:47	5.38	6.65	1.84
8:48	5.41	6.81	1.62
8:49	5.19	6.58	1.75
8:50	5.62	6.58	2.58
8:51	6.88	6.89	4.51
8:52	5.11	7.02	3.18
8:53	5.47	7.06	2.55
8:54	5.88	7.11	2.41
8:55	6.46	7.06	3.23
8:56	7.60	7.84	5.69
8:57	8.91	10.23	8.02
8:58	9.49	12.83	8.72
8:59	8.90	13.90	8.46
9:00	7.72	13.92	8.48
9:01	8.59	14.99	9.32
9:02	10.67	16.73	10.99
9:03	12.49	18.12	12.64
9:04	13.46	16.93	13.21
9:05	10.51	16.10	9.37
9:06	7.88	15.65	6.39
9:07	7.39	15.43	6.27
9:08	7.07	15.47	6.21
9:09	7.65	15.92	6.57
9:10	10.26	16.88	9.17
9:11	12.55	17.65	11.14
9:12	14.21	18.18	12.40
9:13	15.51	18.55	14.79
9:14	16.59	18.79	16.72
9:15	17.50	18.99	17.85
9:16	18.40	19.15	18.51
9:17	19.25	19.25	19.07
9:18	20.08	19.36	19.42
9:19	20.68	19.34	19.77
9:20	20.31	19.24	19.69
9:21	19.29	17.59	19.64

continued

Time	T1	T2	T3
10/15/2004			
9:22	16.69	14.49	18.69
9:23	15.05	13.21	17.72
9:24	13.97	12.51	16.90
9:25	13.33	12.08	16.42
9:26	12.93	12.17	16.23
9:27	12.80	12.23	16.29
9:28	12.99	12.37	16.35
9:29	12.94	12.55	16.75
9:30	12.80	12.74	16.68
9:31	12.78	13.06	16.66
9:32	12.76	13.35	16.74
9:33	12.93	13.89	16.96
9:34	13.12	14.26	17.32
9:35	13.21	14.85	17.66
9:36	13.26	15.18	17.91
9:37	13.41	15.39	17.85
9:38	13.42	15.61	17.87
9:39	13.20	15.79	17.55
9:40	13.32	16.04	17.52
9:41	13.62	16.57	18.04
9:42	13.90	17.07	18.59
9:43	14.17	17.58	18.90
9:44	14.27	17.95	19.38
9:45	14.29	18.59	19.53
9:46	14.38	19.35	19.51
9:47	14.44	20.19	19.40
9:48	14.46	20.65	19.69
9:49	14.58	20.62	20.54
9:50	14.61	21.14	20.05
9:51	14.89	20.98	21.29
9:52	15.10	21.31	21.98
9:53	15.31	21.65	22.03
9:54	15.21	22.30	22.18
9:55	15.08	22.97	22.31
9:56	15.21	23.21	22.05
9:57	15.37	22.18	22.27
9:58	15.28	22.03	21.93
9:59	15.32	22.64	21.49
10:00	15.34	22.57	21.51
10:01	15.29	22.10	21.55
10:02	15.15	21.36	20.99
10:03	15.00	20.84	20.65
10:04	15.04	20.93	20.68
10:05	14.95	20.86	20.45
10:06	14.85	21.03	20.11
10:07	14.78	20.87	20.18
10:08	14.65	20.63	19.88
10:09	14.67	20.98	19.68
10:10	14.64	21.05	19.63
10:11	14.43	20.86	19.49
10:12	14.23	20.44	19.27
10:13	14.06	20.28	19.14

Time	T1	T2	T3
10/15/2004			
10:14	13.78	20.17	18.96
10:15	13.78	20.89	18.92
10:16	13.66	20.86	18.95
10:17	13.47	20.20	18.50
10:18	13.38	20.74	18.92
10:19	13.24	20.48	18.89
10:20	13.09	21.40	18.85
10:21	13.21	22.53	19.12
10:22	13.43	23.89	19.59
10:23	13.61	24.58	20.55
10:24	13.77	25.33	20.89
10:25	13.76	26.55	20.39
10:26	13.78	27.37	20.35
10:27	13.96	27.67	20.70
10:28	14.06	27.45	21.20
10:29	14.14	27.68	20.70
10:30	14.25	28.05	20.91
10:31	14.30	27.79	21.97
10:32	14.35	27.47	22.55
10:33	14.36	27.59	22.55
10:34	14.17	28.21	22.07
10:35	13.94	29.09	20.90
10:36	13.74	29.38	19.98
10:37	13.77	29.30	20.60
10:38	14.04	28.96	21.67
10:39	14.27	29.47	21.94
10:40	14.41	30.45	20.87
10:41	14.60	30.70	21.05
10:42	14.72	31.12	20.48
10:43	14.97	31.33	20.70
10:44	15.10	31.38	20.58
10:45	15.05	31.40	19.70
10:46	14.88	31.66	18.67
10:47	14.91	31.50	18.16
10:48	14.94	31.27	17.93
10:49	14.85	31.03	17.55
10:50	14.90	31.01	17.36
10:51	14.98	31.04	17.24
10:52	15.04	31.07	17.30
10:53	15.15	31.17	17.42
10:54	15.15	31.29	17.20
10:55	15.25	31.37	17.12
10:56	15.30	31.37	17.03
10:57	15.40	31.40	17.14
10:58	15.38	31.43	17.10
10:59	15.42	31.34	17.03
11:00	15.50	31.41	17.39
11:01	15.50	31.77	17.65
11:02	15.51	31.94	17.74
11:03	15.55	32.17	17.82
11:04	15.63	32.40	18.25
11:05	15.59	32.76	18.40

Time	T1	T2	T3
10/15/2004			
11:06	15.56	33.03	18.51
11:07	15.57	33.29	18.63
11:08	15.56	33.34	19.62
11:09	15.82	33.40	20.47
11:10	15.99	33.30	21.07
11:11	16.00	34.07	20.71
11:12	15.95	34.41	21.22
11:13	15.82	35.01	20.76
11:14	15.70	35.43	20.87
11:15	15.56	35.73	21.47
11:16	15.67	35.42	21.41
11:17	15.96	35.47	21.00
11:18	16.25	34.69	22.04
11:19	16.33	33.61	22.85
11:20	16.39	33.97	22.81
11:21	16.54	34.43	22.83
11:22	16.59	34.60	23.03
11:23	16.58	34.79	23.12
11:24	16.62	34.86	23.64
11:25	16.71	34.34	23.75
11:26	16.78	34.41	23.91
11:27	16.87	34.48	23.96
11:28	16.93	33.99	24.06
11:29	16.91	33.13	23.83
11:30	16.96	32.43	23.72
11:31	17.00	31.89	23.71
11:32	17.06	31.72	23.94
11:33	17.04	32.32	23.93
11:34	17.07	32.47	23.72
11:35	17.16	32.50	23.91
11:36	17.28	32.30	23.97
11:37	17.29	32.89	24.23
11:38	17.23	34.56	23.39
11:39	17.07	35.73	21.61
11:40	17.04	35.97	20.58
11:41	17.05	35.66	21.36
11:42	16.99	35.77	22.05
11:43	17.09	35.44	23.32
11:44	17.20	35.20	24.04
11:45	17.10	35.19	23.61
11:46	17.27	35.34	23.89
11:47	17.50	34.77	24.26
11:48	17.70	34.22	24.29
11:49	17.69	33.96	24.05
11:50	17.72	33.16	23.84
11:51	17.97	32.40	24.01
11:52	18.07	32.03	24.04
11:53	18.14	31.68	24.23
11:54	18.18	31.44	24.00
11:55	18.07	31.61	23.62
11:56	18.06	31.30	23.12

continued

Time	T1	T2	T3
10/15/2004			
11:57	18.05	31.66	23.03
11:58	17.97	32.95	23.32
11:59	17.90	35.06	23.35
12:00	18.05	35.37	24.06
12:01	18.28	33.94	24.09
12:02	18.26	33.48	23.79
12:03	18.31	33.44	24.05
12:04	18.31	34.91	23.89
12:05	18.29	35.54	24.39
12:06	18.26	35.68	24.55
12:07	18.25	36.11	24.70
12:08	18.31	36.20	24.84
12:09	18.36	36.37	24.98
12:10	18.40	35.07	23.40
12:11	18.47	32.10	21.84
12:12	18.56	29.09	21.15
12:13	18.62	25.89	20.71
12:14	18.69	23.59	20.48
12:15	18.77	21.99	20.34
12:16	18.75	20.84	20.23
12:17	18.79	20.00	20.18
12:18	18.81	19.38	20.13
12:19	18.72	18.92	20.10
12:20	18.55	18.57	20.12
12:21	18.62	18.29	20.20
12:22	18.74	18.06	20.24
12:23	18.90	17.87	20.31
12:24	19.16	17.71	20.39
12:25	19.15	17.57	20.46
12:26	19.11	17.45	20.48
12:27	19.14	17.34	20.53
12:28	19.14	17.24	20.55
12:29	19.13	17.15	20.57
12:30	19.13	17.07	20.52
12:31	19.16	17.01	20.60
12:32	19.34	16.95	20.66
12:33	19.45	16.91	20.74
12:34	19.50	16.88	20.79
12:35	19.57	16.85	20.83
12:36	19.58	16.82	20.87
12:37	19.60	16.80	20.93
12:38	19.64	16.77	20.94
12:39	19.68	16.75	20.97
12:40	19.68	16.73	21.03
12:41	19.65	16.73	21.10
12:42	19.70	16.72	21.18
12:43	19.67	16.70	21.22
12:44	19.73	16.69	21.33
12:45	19.72	16.69	21.36
12:46	19.75	16.69	21.38
12:47	19.83	16.69	21.45
12:48	19.85	16.69	21.46

Time	T1	T2	T3
10/15/2004			
12:49	19.93	16.69	21.56
12:50	20.08	16.70	21.65
12:51	20.18	16.70	21.69
12:52	20.27	16.69	21.71
12:53	20.40	16.69	21.74
12:54	20.36	16.70	21.75
12:55	20.36	16.70	21.75
12:56	20.35	16.70	21.83
12:57	20.41	16.71	21.89
12:58	20.48	16.72	21.99
12:59	20.50	16.74	22.00
13:00	20.52	16.75	22.00
13:01	20.41	16.76	22.00
13:02	20.36	16.77	22.04
13:03	20.45	16.78	22.13
13:04	20.48	16.79	22.10
13:05	20.53	16.80	22.10
13:06	20.58	16.81	22.10
13:07	20.61	16.82	22.08
13:08	20.64	16.84	22.05
13:09	20.65	16.86	22.07
13:10	20.61	16.87	22.06
13:11	20.64	16.88	22.10
13:12	20.75	16.89	22.15
13:13	20.92	16.91	22.23
13:14	20.90	16.92	22.29
13:15	20.74	16.93	22.29
13:16	20.64	16.94	22.21
13:17	20.77	16.94	22.27
13:18	20.96	16.96	22.37
13:19	20.98	16.97	22.39
13:20	21.08	16.99	22.41
13:21	21.15	17.00	22.43
13:22	20.95	17.02	22.38
13:23	21.01	17.03	22.51
13:24	21.08	17.04	22.62
13:25	21.16	17.06	22.66
13:26	21.18	17.08	22.67
13:27	21.27	17.10	22.74
13:28	21.35	17.12	22.81
13:29	21.33	17.13	22.83
13:30	21.25	17.15	22.80
13:31	21.28	17.16	22.81
13:32	21.31	17.18	22.83
13:33	21.35	17.20	22.91
13:34	21.39	17.22	22.97
13:35	21.38	17.24	22.99
13:36	21.37	17.26	22.93
13:37	21.37	17.28	22.90
13:38	21.43	17.30	22.92
13:39	21.48	17.31	22.95
13:40	21.52	17.34	22.96

Time	T1	T2	T3
10/15/2004			
13:41	21.57	17.36	23.00
13:42	21.65	17.37	23.02
13:43	21.75	17.39	23.08
13:44	21.80	17.41	23.22
13:45	21.89	17.44	23.29
13:46	22.02	17.46	23.35
13:47	22.07	17.48	23.40
13:48	22.01	17.52	23.40
13:49	21.94	17.54	23.43
13:50	21.97	17.58	23.42
13:51	22.03	17.60	23.46
13:52	22.10	17.65	23.47
13:53	21.97	17.68	23.37
13:54	21.89	17.70	23.24
13:55	22.03	17.72	23.32
13:56	22.12	17.74	23.41
13:57	22.16	17.80	23.43
13:58	22.22	17.84	23.48
13:59	22.31	17.85	23.52
14:00	22.42	17.88	23.62
14:01	22.44	17.91	23.68
14:02	22.41	17.96	23.71
14:03	22.36	17.97	23.63
14:04	22.48	17.95	23.57
14:05	22.57	18.02	23.64
14:06	22.63	18.12	23.66
14:07	22.68	18.20	23.68
14:08	22.59	18.25	23.71
14:09	22.65	18.26	23.75
14:10	22.65	18.30	23.78
14:11	22.67	18.31	23.82
14:12	22.68	18.32	23.88
14:13	22.63	18.31	23.89
14:14	22.63	18.32	23.92
14:15	22.61	18.35	23.88
14:16	22.59	18.37	23.85
14:17	22.51	18.37	23.80
14:18	22.40	18.36	23.54
14:19	22.52	18.37	23.69
14:20	22.65	18.40	23.91
14:21	22.79	18.43	24.05
14:22	22.74	18.47	24.13
14:23	22.73	18.50	24.19
14:24	22.77	18.51	24.25
14:25	22.91	18.52	24.35
14:26	23.02	18.52	24.38
14:27	23.04	18.51	24.36
14:28	23.02	18.52	24.37
14:29	23.02	18.52	24.45
14:30	23.03	18.54	24.40
14:31	23.07	18.55	24.38

continued

Time	T1	T2	T3
10/15/2004			
14:32	23.02	18.58	24.32
14:33	23.08	18.62	24.42
14:34	23.09	18.66	24.47
14:35	23.17	18.67	24.60
14:36	23.14	18.68	24.63
14:37	23.18	18.69	24.66
14:38	23.17	18.69	24.71
14:39	23.16	18.69	24.74
14:40	23.11	18.69	24.68
14:41	23.05	18.69	24.68
14:42	23.05	18.70	24.81
14:43	23.22	18.70	24.88
14:44	23.32	18.70	24.92
14:45	23.43	18.72	24.90
14:46	23.55	18.74	24.94
14:47	23.63	18.75	24.98
14:48	23.71	18.78	24.99
14:49	23.70	18.82	24.96
14:50	23.70	18.83	24.96
14:51	23.70	18.83	24.97
14:52	23.52	18.83	24.87
14:53	23.47	18.83	24.98
14:54	23.49	18.85	24.97
14:55	24.00	18.85	24.97
14:56	24.07	18.85	24.97
14:57	24.25	18.86	25.13
14:58	24.27	18.87	25.16
14:59	23.82	18.87	24.84
15:00	23.52	18.91	24.68
15:01	23.46	18.95	24.69
15:02	23.42	18.98	24.76
15:03	23.51	19.02	24.77
15:04	23.63	19.04	24.79
15:05	23.64	19.07	24.82
15:06	23.76	19.10	24.89
15:07	23.69	19.12	24.83
15:08	23.63	19.14	24.72
15:09	23.70	19.16	24.89
15:10	23.82	19.18	25.04
15:11	24.03	19.19	25.25
15:12	24.09	19.20	25.38
15:13	24.13	19.22	25.39
15:14	24.17	19.24	25.40
15:15	24.22	19.25	25.40
15:16	24.23	19.26	25.43
15:17	24.35	19.26	25.47
15:18	24.31	19.27	25.42
15:19	24.25	19.27	25.32
15:20	24.29	19.27	25.37
15:21	24.22	19.27	25.36
15:22	24.22	19.29	25.44
15:23	24.28	19.30	25.53

Time	T1	T2	T3
10/15/2004			
15:24	24.25	19.32	25.57
15:25	24.24	19.34	25.66
15:26	24.36	19.36	25.69
15:27	24.39	19.37	25.67
15:28	24.42	19.36	25.55
15:29	24.44	19.36	25.69
15:30	24.59	19.36	25.84
15:31	24.71	19.36	25.88
15:32	24.62	19.34	25.80
15:33	24.49	19.35	25.73
15:34	24.31	19.37	25.60
15:35	24.24	19.39	25.50
15:36	24.20	19.38	25.43
15:37	24.24	19.40	25.54
15:38	24.45	19.43	25.67
15:39	24.57	19.43	25.79
15:40	24.64	19.44	25.93
15:41	24.61	19.44	25.99
15:42	24.55	19.45	26.01
15:43	24.61	19.46	26.03
15:44	24.66	19.47	26.05
15:45	24.77	19.47	26.16
15:46	24.77	19.48	26.19
15:47	24.83	19.49	26.17
15:48	24.89	19.49	26.14
15:49	24.99	19.50	26.14
15:50	25.07	19.51	26.20
15:51	25.13	19.51	26.21
15:52	25.24	19.54	26.35
15:53	25.11	19.52	26.28
15:54	25.16	19.53	26.27
15:55	25.24	19.54	26.35
15:56	25.34	19.54	26.44
15:57	25.35	19.55	26.48
15:58	25.36	19.55	26.45
15:59	25.47	19.55	26.48
16:00	25.53	19.56	26.46
16:01	rem	19.57	26.53
16:02	rem	19.57	26.64
16:03	rem	19.58	26.64
16:04	rem	19.58	26.64
16:05	rem	19.59	26.63
16:06	rem	19.59	26.65
16:07	26.32	19.60	26.64
16:08	26.29	19.60	26.72
16:09	26.16	19.61	26.76
16:10	26.11	19.60	26.75
16:11	26.18	19.61	26.82
16:12	26.19	19.60	26.75
16:13	26.04	19.61	26.76
16:14	26.16	19.61	26.93
16:15	26.29	19.63	27.02

Time	T1	T2	T3
10/15/2004			
16:16	26.40	19.63	27.08
16:17	26.28	19.64	27.09
16:18	26.18	19.65	26.99
16:19	26.08	19.65	26.93
16:20	26.12	19.65	26.93
16:21	26.28	19.66	26.95
16:22	26.35	19.67	26.97
16:23	26.43	19.67	26.99
16:24	26.28	19.67	26.79
16:25	26.16	19.61	26.70
16:26	26.06	19.56	26.66
16:27	25.96	19.55	26.65
16:28	25.88	19.57	26.75
16:29	25.72	19.59	26.72
16:30	25.69	19.60	26.63
16:31	25.62	19.58	26.58
16:32	25.59	19.56	26.58
16:33	25.47	19.58	26.53
16:34	25.25	19.61	26.50
16:35	25.09	19.61	26.40
16:36	25.02	19.60	26.35
16:37	25.20	19.59	26.40
16:38	25.44	19.60	26.41
16:39	25.60	19.62	26.53
16:40	25.65	19.62	26.60
16:41	25.63	19.61	26.65
16:42	25.69	19.61	26.66
16:43	25.64	19.61	26.67
16:44	25.43	19.62	26.63
16:45	25.25	19.61	26.51
16:46	25.07	19.61	26.37
16:47	24.96	19.61	26.18
16:48	24.86	19.59	26.10
16:49	24.67	19.59	26.08
16:50	24.62	19.58	26.04
16:51	24.78	19.56	26.04
16:52	24.82	19.56	26.01
16:53	24.80	19.56	26.00
16:54	24.78	19.56	25.97
16:55	24.71	19.56	25.90
16:56	24.75	19.55	25.86
16:57	24.84	19.54	25.88
16:58	24.91	19.55	25.92
16:59	25.00	19.55	25.92
17:00	25.02	19.55	25.91
17:01	24.92	19.56	25.90
17:02	24.86	19.55	25.85
17:03	24.90	19.55	25.83
17:04	24.89	19.56	25.80
17:05	24.88	19.56	25.80
17:06	24.86	19.57	25.80

continued

Time	T1	T2	T3
10/15/2004			
17:07	24.89	19.57	25.78
17:08	24.93	19.57	25.81
17:09	25.03	19.56	25.81
17:10	25.04	19.56	25.76
17:11	24.91	19.55	25.61
17:12	24.74	19.53	25.39
17:13	24.77	19.51	25.33
17:14	24.93	19.50	25.41
17:15	25.16	19.49	25.55
17:16	25.28	19.48	25.63
17:17	25.28	19.47	25.60
17:18	25.19	19.46	25.56
17:19	25.09	19.45	25.57
17:20	25.05	19.44	25.56
17:21	25.01	19.41	25.50
17:22	25.00	19.39	25.47
17:23	24.99	19.37	25.53
17:24	25.07	19.36	25.61
17:25	25.20	19.34	25.69
17:26	25.32	19.33	25.76
17:27	25.34	19.31	25.80
17:28	25.33	19.30	25.81
17:29	25.06	19.29	25.69
17:30	24.91	19.29	25.58
17:31	24.84	19.28	25.56
17:32	24.86	19.27	25.58
17:33	24.90	19.26	25.58
17:34	24.93	19.25	25.58
17:35	24.87	19.24	25.61
17:36	24.77	19.23	25.59
17:37	24.60	19.22	25.56
17:38	24.39	19.22	25.49
17:39	24.23	19.21	25.45
17:40	24.00	19.20	25.41
17:41	23.80	19.19	25.38
17:42	23.78	19.18	25.34
17:43	23.70	19.17	25.28
17:44	23.61	19.16	25.21
17:45	23.58	19.15	25.13
17:46	23.50	19.14	25.06
17:47	23.47	19.13	25.01
17:48	20.35	19.12	24.11
17:49	18.11	19.10	20.84
17:50	18.48	19.05	20.61
17:51	18.64	19.05	20.68
17:52	18.01	19.07	20.46
17:53	17.27	19.08	19.71
17:54	16.49	19.08	19.18
17:55	15.53	19.06	18.59
17:56	15.05	19.05	18.14
17:57	15.22	19.04	17.99
17:58	15.91	19.03	18.09

Time	T1	T2	T3
10/15/2004			
17:59	16.38	19.02	18.22
18:00	17.28	19.00	18.45
18:01	18.12	19.00	18.56
18:02	18.78	18.99	18.57
18:03	19.45	18.98	18.33
18:04	19.80	18.97	18.07
18:05	20.02	18.96	18.11
18:06	20.10	18.95	18.15
18:07	20.12	18.95	18.16
18:08	20.13	18.93	18.12
18:09	19.95	18.93	18.22
18:10	19.90	18.92	18.29
18:11	19.85	18.90	18.21
18:12	19.68	18.89	18.36
18:13	19.65	18.88	18.46
18:14	19.17	18.87	18.42
18:15	18.59	18.85	18.35
18:16	18.50	18.84	18.38
18:17	18.43	18.83	18.43
18:18	18.04	18.83	18.45
18:19	17.85	18.82	18.47
18:20	17.73	18.80	18.50
18:21	17.67	18.79	18.56
18:22	17.64	18.78	18.62
18:23	17.42	18.77	18.63
18:24	17.22	18.76	18.59
18:25	16.98	18.75	18.46
18:26	16.84	18.73	18.30
18:27	16.80	18.72	18.19
18:28	16.91	18.72	18.17
18:29	16.94	18.72	18.17
18:30	16.95	18.71	18.18
18:31	16.85	18.71	18.16
18:32	17.08	18.70	18.18
18:33	17.24	18.69	18.24
18:34	17.21	18.68	18.23
18:35	17.27	18.67	18.22
18:36	17.32	18.66	18.20
18:37	17.35	18.65	18.11
18:38	17.38	18.64	18.00
18:39	17.39	18.63	17.90
18:40	17.40	18.62	17.79
18:41	17.41	18.61	17.71
18:42	17.39	18.60	17.61
18:43	17.39	18.59	17.44
18:44	17.38	18.57	17.36
18:45	17.39	18.55	17.44
18:46	17.39	18.53	17.47
18:47	17.45	18.43	17.44
18:48	17.42	18.40	17.39
18:49	17.43	18.35	17.22
18:50	17.42	18.29	17.25

Time	T1	T2	T3
10/15/2004			
18:51	17.42	18.16	17.29
18:52	17.45	18.09	17.28
18:53	17.42	18.06	17.28
18:54	17.39	18.02	17.22
18:55	17.39	17.99	17.11
18:56	17.38	17.93	17.10
18:57	17.35	17.88	17.02
18:58	17.36	17.81	17.09
18:59	17.36	17.74	17.13
19:00	17.35	17.75	17.11
19:01	17.34	17.77	17.08
19:02	17.33	17.69	17.10
19:03	17.32	17.63	17.06
19:04	17.32	17.67	17.10
19:05	17.31	17.67	17.13
19:06	17.28	17.63	17.13
19:07	17.27	17.73	17.14
19:08	17.27	17.59	17.14
19:09	17.24	17.53	17.11
19:10	17.26	17.62	17.13
19:11	17.27	17.49	17.15
19:12	17.22	17.41	17.13
19:13	17.21	17.32	17.11
19:14	17.21	17.34	17.10
19:15	17.21	17.32	17.10
19:16	17.19	17.31	17.09
19:17	17.18	17.40	17.08
19:18	17.17	17.48	17.08
19:19	17.17	17.37	17.07
19:20	17.17	17.24	17.07
19:21	17.16	17.33	17.06
19:22	17.15	17.39	17.06
19:23	17.15	17.31	17.06
19:24	17.15	17.19	17.05
19:25	17.14	17.18	17.04
19:26	17.14	17.32	17.05
19:27	17.14	17.29	17.04
19:28	17.15	17.20	17.04
19:29	17.13	17.19	17.04
19:30	17.12	17.22	17.03
19:31	17.12	17.25	17.03
19:32	17.12	17.24	17.03
19:33	17.12	17.23	17.02
19:34	17.12	17.22	17.02
19:35	17.12	17.23	17.02
19:36	17.12	17.24	17.02
19:37	17.11	17.28	17.02
19:38	17.13	17.30	17.01
19:39	17.13	17.26	17.02
19:40	17.11	17.21	17.01
19:41	17.12	17.18	17.00

continued

Time	T1	T2	T3
10/15/2004			
19:42	17.11	17.18	17.01
19:43	17.11	17.19	17.01
19:44	17.10	17.19	17.00
19:45	17.10	17.17	17.01
19:46	17.10	17.16	16.99
19:47	17.11	17.15	17.01
19:48	17.09	17.15	17.00
19:49	17.08	17.16	16.99
19:50	17.08	17.16	16.99
19:51	17.09	17.20	16.99
19:52	17.05	17.18	16.96
19:53	17.03	17.11	16.93
19:54	17.05	17.04	16.94
19:55	17.06	17.01	16.95
19:56	17.05	17.03	16.96
19:57	17.04	17.03	16.95
19:58	17.05	17.00	16.95
19:59	17.03	16.97	16.93
20:00	17.02	16.98	16.93
20:01	17.02	16.99	16.93
20:02	17.03	16.96	16.93
20:03	17.02	16.90	16.93
20:04	17.03	16.86	16.93
20:05	17.01	16.87	16.93
20:06	17.02	16.86	16.91
20:07	17.02	16.87	16.92
20:08	17.01	16.89	16.92
20:09	17.01	16.87	16.91
20:10	17.00	16.84	16.90
20:11	16.99	16.82	16.88
20:12	16.99	16.82	16.87
20:13	16.97	16.82	16.87
20:14	16.97	16.80	16.87
20:15	17.00	16.75	16.91
20:16	17.00	16.71	16.90
20:17	16.93	16.81	16.83
20:18	16.89	16.75	16.78
20:19	16.87	16.63	16.78
20:20	16.86	16.61	16.77
20:21	16.84	16.63	16.76
20:22	16.85	16.62	16.77
20:23	16.89	16.62	16.80
20:24	16.90	16.59	16.82
20:25	16.92	16.40	16.83
20:26	16.93	16.37	16.84
20:27	16.90	16.46	16.82
20:28	16.88	16.46	16.80
20:29	16.90	16.41	16.81
20:30	16.90	16.42	16.81
20:31	16.89	16.47	16.80
20:32	16.89	16.48	16.80
20:33	16.90	16.46	16.81

Time	T1	T2	T3
10/15/2004			
20:34	16.92	16.38	16.83
20:35	16.91	16.45	16.82
20:36	16.89	16.41	16.82
20:37	16.89	16.43	16.81
20:38	16.90	16.33	16.81
20:39	16.90	16.36	16.81
20:40	16.90	16.36	16.81
20:41	16.89	16.36	16.79
20:42	16.86	16.32	16.79
20:43	16.85	16.12	16.77
20:44	16.89	16.13	16.79
20:45	16.86	16.15	16.77
20:46	16.86	16.08	16.77
20:47	16.86	15.99	16.77
20:48	16.83	16.18	16.73
20:49	16.81	16.31	16.71
20:50	16.81	16.35	16.73
20:51	16.90	15.98	16.79
20:52	16.99	15.81	16.83
20:53	17.00	15.92	16.85
20:54	16.84	16.08	16.77
20:55	16.82	16.36	16.72
20:56	16.83	16.50	16.74
20:57	16.85	16.60	16.75
20:58	16.85	16.66	16.76
20:59	16.85	16.72	16.76
21:00	16.85	16.72	16.76
21:01	16.85	16.66	16.76
21:02	16.86	16.58	16.77
21:03	16.87	16.50	16.77
21:04	16.86	16.42	16.77
21:05	16.83	16.38	16.74
21:06	16.86	16.36	16.76
21:07	16.86	16.30	16.76
21:08	16.79	16.23	16.72
21:09	16.74	16.11	16.69
21:10	16.75	15.95	16.67
21:11	16.78	15.76	16.69
21:12	16.76	15.79	16.67
21:13	16.75	16.00	16.68
21:14	16.73	16.03	16.66
21:15	16.75	16.03	16.64
21:16	16.77	15.98	16.66
21:17	16.78	15.66	16.69
21:18	16.80	15.46	16.71
21:19	16.79	15.53	16.71
21:20	16.82	15.60	16.74
21:21	16.85	15.48	16.75
21:22	16.87	15.27	16.78
21:23	16.96	15.14	16.78
21:24	17.02	15.48	16.82
21:25	16.80	15.57	16.71

Time	T1	T2	T3
10/15/2004			
21:26	16.78	15.90	16.69
21:27	16.78	16.12	16.69
21:28	16.79	16.29	16.70
21:29	16.81	16.39	16.71
21:30	16.82	16.47	16.72
21:31	16.83	16.53	16.74
21:32	16.87	16.46	16.77
21:33	16.89	16.33	16.80
21:34	16.87	16.19	16.78
21:35	16.84	15.97	16.77
21:36	16.87	15.89	16.78
21:37	16.90	15.85	16.79
21:38	16.91	15.80	16.81
21:39	16.93	15.73	16.84
21:40	16.93	15.66	16.82
21:41	16.88	15.60	16.77
21:42	16.88	15.61	16.77
21:43	17.06	15.80	16.86
21:44	17.04	15.77	16.88
21:45	17.01	15.77	16.89
21:46	17.07	15.78	16.91
21:47	17.09	15.76	16.93
21:48	17.08	15.75	16.94
21:49	17.08	15.78	16.95
21:50	17.10	15.81	16.97
21:51	17.10	15.83	16.98
21:52	17.10	15.85	16.99
21:53	17.11	15.86	16.99
21:54	17.11	15.91	16.99
21:55	17.05	16.16	16.95
21:56	17.01	16.54	16.90
21:57	16.98	16.44	16.86
21:58	16.95	16.21	16.81
21:59	16.94	16.16	16.81
22:00	16.95	16.18	16.83
22:01	16.93	16.24	16.83
22:02	16.93	16.29	16.82
22:03	16.91	16.28	16.81
22:04	16.90	16.29	16.79
22:05	16.90	16.29	16.79
22:06	16.92	16.28	16.83
22:07	16.92	16.28	16.80
22:08	16.89	16.27	16.79
22:09	16.86	16.26	16.76
22:10	16.87	16.26	16.76
22:11	16.81	16.26	16.72
22:12	16.75	16.17	16.65
22:13	16.65	16.08	16.60
22:14	16.73	16.06	16.61
22:15	16.80	15.96	16.71
22:16	16.94	15.74	16.80

continued

Time	T1	T2	T3
10/15/2004			
22:17	17.07	15.79	16.82
22:18	17.09	15.78	16.83
22:19	17.09	15.82	16.91
22:20	17.09	15.85	16.91
22:21	17.09	15.87	16.93
22:22	17.10	15.86	16.95
22:23	17.11	15.88	16.97
22:24	17.11	15.91	16.97
22:25	17.10	15.98	16.97
22:26	17.03	16.20	16.93
22:27	16.98	16.56	16.88
22:28	16.93	16.36	16.83
22:29	16.90	16.08	16.78
22:30	16.90	16.01	16.79
22:31	16.88	16.05	16.78
22:32	16.86	16.21	16.77
22:33	16.83	16.31	16.75
22:34	16.78	16.32	16.72
22:35	16.83	16.31	16.75
22:36	16.81	16.30	16.76
22:37	16.81	16.28	16.76
22:38	16.82	16.28	16.75
22:39	16.77	16.27	16.67
22:40	16.72	16.26	16.65
22:41	16.67	16.17	16.61
22:42	16.66	16.14	16.61
22:43	16.65	16.19	16.62
22:44	16.70	16.22	16.64
22:45	16.78	16.16	16.71
22:46	16.89	15.90	16.78
22:47	16.98	15.86	16.74
22:48	17.08	15.78	16.81
22:49	17.09	15.80	16.85
22:50	17.09	15.83	16.91
22:51	17.10	15.84	16.93
22:52	17.11	15.85	16.95
22:53	17.11	15.88	16.97
22:54	17.11	15.91	16.97
22:55	17.11	15.93	16.98
22:56	17.12	15.97	16.99
22:57	17.05	16.09	16.94
22:58	16.99	16.42	16.89
22:59	16.96	16.12	16.85
23:00	16.95	15.90	16.84
23:01	16.87	15.84	16.79
23:02	16.81	15.90	16.75
23:03	16.78	16.22	16.71
23:04	16.78	16.34	16.69
23:05	16.79	16.37	16.69
23:06	16.80	16.37	16.72
23:07	16.75	16.36	16.69
23:08	16.78	16.34	16.70

Time	T1	T2	T3
10/15/2004			
23:09	16.82	16.31	16.72
23:10	16.70	16.28	16.66
23:11	16.74	16.28	16.66
23:12	16.71	16.23	16.62
23:13	16.67	16.18	16.61
23:14	16.77	16.12	16.71
23:15	16.65	16.15	16.57
23:16	16.67	16.21	16.59
23:17	16.81	16.12	16.72
23:18	16.99	15.94	16.80
23:19	17.10	15.71	16.86
23:20	17.10	15.74	16.90
23:21	17.11	15.82	16.94
23:22	17.12	15.86	16.97
23:23	17.13	15.89	16.98
23:24	17.13	15.91	16.99
23:25	17.13	15.93	17.00
23:26	17.14	15.95	17.01
23:27	17.13	15.96	17.00
23:28	17.13	15.98	17.01
23:29	17.05	16.20	16.95
23:30	17.00	16.37	16.90
23:31	16.95	16.07	16.83
23:32	16.93	15.94	16.80
23:33	16.87	15.94	16.72
23:34	16.81	15.98	16.70
23:35	16.80	16.29	16.70
23:36	16.80	16.45	16.69
23:37	16.79	16.48	16.69
23:38	16.76	16.48	16.70
23:39	16.78	16.48	16.67
23:40	16.79	16.45	16.70
23:41	16.77	16.43	16.66
23:42	16.72	16.42	16.61
23:43	16.65	16.42	16.56
23:44	16.56	16.39	16.46
23:45	16.56	16.35	16.50
23:46	16.67	16.34	16.60
23:47	16.73	16.34	16.61
23:48	16.76	16.31	16.69
23:49	16.78	16.11	16.67
23:50	16.85	15.95	16.68
23:51	17.06	15.77	16.81
23:52	17.09	15.58	16.85
23:53	17.09	15.68	16.90
23:54	17.12	15.77	16.95
23:55	17.12	15.82	16.96
23:56	17.12	15.85	16.97
23:57	17.12	15.88	16.98
23:58	17.13	15.89	16.99
23:59	17.12	15.90	17.00

Time	T1	T2	T3
10/16/2004			
0:00	17.03	16.22	16.94
0:01	16.98	16.58	16.88
0:02	16.96	16.21	16.87
0:03	16.94	15.92	16.82
0:04	16.93	15.85	16.82
0:05	16.90	15.90	16.78
0:06	16.81	16.10	16.73
0:07	16.75	16.22	16.68
0:08	16.71	16.24	16.65
0:09	16.74	16.25	16.69
0:10	16.83	16.25	16.72
0:11	16.79	16.23	16.69
0:12	16.81	16.23	16.68
0:13	16.74	16.24	16.61
0:14	16.72	16.17	16.64
0:15	16.82	16.06	16.73
0:16	16.83	16.05	16.74
0:17	16.86	16.07	16.77
0:18	16.85	16.03	16.77
0:19	16.90	15.86	16.72
0:20	17.03	15.71	16.81
0:21	17.12	15.67	16.88
0:22	17.13	15.67	16.92
0:23	17.12	15.72	16.96
0:24	17.13	15.77	16.98
0:25	17.11	15.82	16.98
0:26	17.01	16.22	16.92
0:27	16.96	16.64	16.86
0:28	16.92	16.76	16.79
0:29	16.91	16.37	16.81
0:30	16.92	16.07	16.82
0:31	16.89	15.97	16.82
0:32	16.85	15.99	16.76
0:33	16.81	16.04	16.72
0:34	16.77	16.08	16.68
0:35	16.80	16.10	16.71
0:36	16.85	16.12	16.75
0:37	16.87	16.14	16.78
0:38	16.82	16.14	16.75
0:39	16.81	16.16	16.71
0:40	16.85	16.08	16.76
0:41	16.78	16.07	16.70
0:42	16.77	16.05	16.69
0:43	16.80	15.95	16.73
0:44	16.84	15.93	16.75
0:45	16.88	15.91	16.79
0:46	16.99	15.65	16.82
0:47	17.08	15.66	16.83
0:48	17.12	15.70	16.90
0:49	17.12	15.74	16.94
0:50	17.13	15.77	16.96

continued

Time	T1	T2	T3
10/16/2004			
0:51	17.12	15.79	16.98
0:52	17.13	15.81	16.99
0:53	17.13	15.83	17.00
0:54	17.13	15.84	17.00
0:55	17.13	15.85	17.00
0:56	17.02	16.17	16.92
0:57	16.98	16.56	16.88
0:58	16.95	16.28	16.81
0:59	16.88	15.87	16.77
1:00	16.87	15.77	16.76
1:01	16.80	15.81	16.72
1:02	16.78	16.00	16.68
1:03	16.74	16.11	16.66
1:04	16.74	16.15	16.66
1:05	16.79	16.15	16.68
1:06	16.75	16.15	16.69
1:07	16.77	16.14	16.66
1:08	16.68	16.13	16.59
1:09	16.69	16.13	16.59
1:10	16.70	16.13	16.62
1:11	16.73	16.13	16.63
1:12	16.76	16.14	16.66
1:13	16.79	15.89	16.69
1:14	16.81	15.80	16.63
1:15	17.03	15.60	16.77
1:16	17.08	15.50	16.83
1:17	17.09	15.59	16.88
1:18	17.10	15.66	16.94
1:19	17.12	15.71	16.95
1:20	17.11	15.75	16.96
1:21	17.12	15.78	16.97
1:22	17.13	15.79	16.99
1:23	17.08	15.86	16.97
1:24	16.97	16.34	16.88
1:25	16.93	16.62	16.80
1:26	16.93	16.17	16.83
1:27	16.88	15.83	16.76
1:28	16.83	15.78	16.74
1:29	16.77	15.83	16.70
1:30	16.69	15.97	16.63
1:31	16.67	16.05	16.59
1:32	16.68	16.06	16.62
1:33	16.72	16.06	16.67
1:34	16.75	16.05	16.68
1:35	16.74	16.06	16.65
1:36	16.71	16.05	16.68
1:37	16.77	16.00	16.70
1:38	16.67	15.98	16.60
1:39	16.57	16.02	16.52
1:40	16.67	16.02	16.62
1:41	16.69	16.02	16.63
1:42	16.78	15.88	16.68

Time	T1	T2	T3
10/16/2004			
1:43	16.84	15.69	16.68
1:44	17.02	15.45	16.77
1:45	17.08	15.45	16.85
1:46	17.11	15.56	16.92
1:47	17.11	15.62	16.93
1:48	17.11	15.65	16.95
1:49	17.12	15.69	16.96
1:50	17.14	15.70	16.98
1:51	17.13	15.71	16.99
1:52	17.12	15.75	16.99
1:53	17.12	16.06	16.99
1:54	16.99	16.16	16.90
1:55	16.97	16.10	16.87
1:56	16.91	15.83	16.79
1:57	16.85	15.61	16.71
1:58	16.87	15.52	16.75
1:59	16.82	15.56	16.74
2:00	16.67	15.94	16.62
2:01	16.62	16.18	16.54
2:02	16.67	16.25	16.60
2:03	16.72	16.25	16.66
2:04	16.69	16.24	16.63
2:05	16.68	16.22	16.57
2:06	16.57	16.20	16.51
2:07	16.57	16.18	16.57
2:08	16.69	16.14	16.65
2:09	16.75	16.11	16.69
2:10	16.89	16.00	16.77
2:11	17.03	15.67	16.73
2:12	17.04	15.69	16.78
2:13	17.06	15.74	16.83
2:14	17.08	15.77	16.87
2:15	17.08	15.77	16.91
2:16	17.09	15.77	16.93
2:17	17.11	15.76	16.94
2:18	17.12	15.76	16.96
2:19	17.11	15.75	16.96
2:20	17.12	15.72	16.97
2:21	17.13	15.72	16.98
2:22	17.05	15.88	16.94
2:23	16.97	16.30	16.87
2:24	16.88	16.07	16.78
2:25	16.85	15.67	16.76
2:26	16.74	15.50	16.73
2:27	16.60	15.53	16.58
2:28	16.55	15.78	16.49
2:29	16.59	16.10	16.53
2:30	16.60	16.19	16.53
2:31	16.63	16.24	16.55
2:32	16.67	16.23	16.57
2:33	16.65	16.22	16.56
2:34	16.65	16.21	16.58

Time	T1	T2	T3
10/16/2004			
2:35	16.61	16.18	16.53
2:36	16.54	16.15	16.49
2:37	16.56	16.13	16.51
2:38	16.70	16.10	16.62
2:39	16.74	15.89	16.63
2:40	16.49	15.74	16.43
2:41	16.42	15.93	16.35
2:42	16.48	15.99	16.40
2:43	16.50	16.01	16.43
2:44	16.55	15.99	16.47
2:45	16.80	15.69	16.62
2:46	17.00	15.39	16.74
2:47	17.05	15.22	16.79
2:48	17.07	15.29	16.88
2:49	17.10	15.38	16.91
2:50	17.11	15.43	16.93
2:51	17.12	15.48	16.95
2:52	17.13	15.53	16.97
2:53	17.11	15.54	16.97
2:54	17.07	15.72	16.95
2:55	16.95	16.27	16.86
2:56	16.89	16.62	16.77
2:57	16.91	16.10	16.77
2:58	16.83	15.70	16.74
2:59	16.72	15.60	16.69
3:00	16.67	15.69	16.67
3:01	16.68	15.84	16.64
3:02	16.69	15.91	16.63
3:03	16.75	15.94	16.66
3:04	16.71	15.94	16.65
3:05	16.74	15.93	16.67
3:06	16.73	15.94	16.63
3:07	16.59	15.93	16.51
3:08	16.62	15.91	16.54
3:09	16.62	15.91	16.57
3:10	16.73	15.85	16.66
3:11	16.67	15.59	16.57
3:12	16.75	15.56	16.60
3:13	17.03	15.30	16.74
3:14	17.03	15.34	16.80
3:15	17.07	15.40	16.86
3:16	17.10	15.44	16.90
3:17	17.10	15.46	16.93
3:18	17.11	15.52	16.94
3:19	17.12	15.54	16.96
3:20	17.12	15.54	16.97
3:21	17.13	15.54	16.97
3:22	17.11	15.80	16.96
3:23	17.01	16.12	16.90
3:24	16.90	16.28	16.79
3:25	16.89	15.90	16.74

continued

Time	T1	T2	T3
10/16/2004			
3:26	16.87	15.40	16.74
3:27	16.72	15.23	16.63
3:28	16.60	15.28	16.49
3:29	16.52	15.41	16.41
3:30	16.48	15.66	16.38
3:31	16.47	15.79	16.37
3:32	16.50	15.82	16.39
3:33	16.49	15.82	16.44
3:34	16.48	15.82	16.42
3:35	16.44	15.82	16.38
3:36	16.51	15.82	16.43
3:37	16.62	15.78	16.52
3:38	16.54	15.51	16.44
3:39	16.30	15.57	16.24
3:40	16.22	15.76	16.17
3:41	16.30	15.76	16.25
3:42	16.34	15.71	16.28
3:43	16.68	15.54	16.54
3:44	16.99	15.31	16.69
3:45	17.03	15.31	16.73
3:46	17.06	15.30	16.81
3:47	17.06	15.26	16.86
3:48	17.09	15.28	16.88
3:49	17.09	15.30	16.92
3:50	17.10	15.34	16.93
3:51	17.09	15.36	16.95
3:52	17.12	15.60	16.96
3:53	17.00	16.15	16.89
3:54	16.92	16.66	16.82
3:55	16.87	16.29	16.77
3:56	16.82	15.75	16.73
3:57	16.77	15.45	16.67
3:58	16.53	15.34	16.51
3:59	16.36	15.38	16.37
4:00	16.39	15.48	16.32
4:01	16.44	15.57	16.37
4:02	16.49	15.60	16.40
4:03	16.52	15.61	16.44
4:04	16.54	15.62	16.46
4:05	16.47	15.63	16.38
4:06	16.38	15.64	16.36
4:07	16.51	15.64	16.47
4:08	16.43	15.55	16.38
4:09	16.33	15.54	16.27
4:10	16.74	15.27	16.54
4:11	16.93	15.11	16.67
4:12	16.99	15.14	16.74
4:13	17.05	15.10	16.80
4:14	17.07	14.89	16.87
4:15	17.08	14.96	16.89
4:16	17.09	15.10	16.91
4:17	17.10	15.24	16.94

Time	T1	T2	T3
10/16/2004			
4:18	17.10	15.73	16.95
4:19	17.12	16.10	16.97
4:20	17.13	16.74	16.98
4:21	17.15	17.05	16.99
4:22	16.99	16.47	16.83
4:23	17.01	16.04	16.87
4:24	17.03	16.24	16.90
4:25	17.04	16.49	16.91
4:26	17.06	16.49	16.93
4:27	17.07	16.32	16.95
4:28	17.07	16.04	16.96
4:29	17.07	15.68	16.96
4:30	17.03	15.49	16.92
4:31	16.73	15.37	16.40
4:32	12.96	15.23	13.04
4:33	9.68	15.16	10.48
4:34	8.25	15.11	10.16
4:35	8.20	15.10	10.76
4:36	8.38	15.09	11.04
4:37	8.06	15.12	10.19
4:38	7.90	15.15	9.64
4:39	7.36	15.18	8.64
4:40	6.73	15.22	7.79
4:41	6.25	15.24	7.61
4:42	5.86	15.27	7.66
4:43	5.77	15.29	8.07
4:44	6.01	15.30	7.98
4:45	6.67	15.32	8.15
4:46	6.67	15.33	7.53
4:47	6.91	15.34	7.53
4:48	7.39	15.34	7.89
4:49	7.67	15.34	7.88
4:50	7.91	15.35	7.80
4:51	7.91	15.35	7.50
4:52	7.84	15.36	7.47
4:53	7.81	15.36	7.45
4:54	7.87	15.37	7.50
4:55	7.82	15.36	7.47
4:56	7.85	15.37	7.40
4:57	7.78	15.37	7.28
4:58	7.65	15.37	7.21
4:59	7.61	15.37	7.17
5:00	7.54	15.37	7.10
5:01	7.51	15.37	7.07
5:02	7.59	15.37	7.08
5:03	7.57	15.37	6.98
5:04	7.51	15.37	6.97
5:05	7.56	15.36	7.06
5:06	7.58	15.36	7.02
5:07	7.43	15.36	6.91
5:08	7.24	15.36	6.78
5:09	7.27	15.35	6.80

Time	T1	T2	T3
10/16/2004			
5:10	7.46	15.34	6.98
5:11	7.60	15.33	7.15
5:12	7.68	15.33	7.23
5:13	7.73	15.32	7.15
5:14	7.79	15.31	7.07
5:15	7.66	15.31	6.88
5:16	7.41	15.30	6.78
5:17	7.20	15.30	6.66
5:18	7.34	15.29	6.82
5:19	7.57	15.28	7.02
5:20	7.68	15.27	7.00
5:21	7.66	15.26	6.88
5:22	7.61	15.24	6.74
5:23	7.40	15.22	6.67
5:24	7.31	15.21	6.66
5:25	7.36	15.19	6.66
5:26	7.46	15.17	6.65
5:27	7.41	15.16	6.57
5:28	7.20	15.14	6.50
5:29	7.07	15.12	6.53
5:30	7.00	15.10	6.55
5:31	6.97	15.09	6.57
5:32	6.97	15.08	6.54
5:33	7.06	15.06	6.52
5:34	7.15	15.05	6.49
5:35	7.06	15.03	6.44
5:36	7.01	15.02	6.39
5:37	7.03	14.99	6.31
5:38	7.07	14.96	6.39
5:39	6.97	14.94	6.43
5:40	6.84	14.93	6.41
5:41	6.82	14.92	6.44
5:42	6.84	14.91	6.48
5:43	6.81	14.89	6.47
5:44	6.71	14.87	6.38
5:45	6.81	14.86	6.45
5:46	6.89	14.84	6.51
5:47	6.93	14.82	6.51
5:48	6.85	14.79	6.45
5:49	6.85	14.77	6.42
5:50	6.91	14.75	6.42
5:51	6.94	14.73	6.41
5:52	6.82	14.71	6.32
5:53	6.63	14.69	6.19
5:54	6.62	14.66	6.12
5:55	6.79	14.65	6.16
5:56	6.92	14.63	6.23
5:57	6.75	14.61	6.17
5:58	6.70	14.59	6.13
5:59	6.79	14.57	6.17
6:00	6.88	14.56	6.21

continued

Time	T1	T2	T3
10/16/2004			
6:01	6.90	14.54	6.19
6:02	7.06	14.52	6.21
6:03	8.63	14.51	6.23
6:04	12.53	14.49	6.30
6:05	14.64	14.46	6.42
6:06	16.15	14.44	6.60
6:07	16.41	14.42	6.84
6:08	16.67	14.49	7.07
6:09	16.30	14.76	7.18
6:10	16.17	15.07	7.25
6:11	15.68	15.28	7.40
6:12	15.17	15.46	7.59
6:13	14.81	15.62	7.78
6:14	14.74	15.70	8.85
6:15	15.44	15.77	11.80
6:16	14.84	15.82	14.11
6:17	14.77	15.82	15.37
6:18	15.18	15.82	16.12
6:19	15.19	15.74	16.14
6:20	15.33	15.73	16.10
6:21	15.80	15.80	16.27
6:22	16.02	15.69	16.22
6:23	15.90	15.73	15.99
6:24	15.85	15.74	15.94
6:25	15.72	15.69	16.03
6:26	16.19	15.60	16.16
6:27	16.34	15.54	16.23
6:28	16.34	15.59	16.30
6:29	16.38	15.60	16.34
6:30	16.41	15.61	16.35
6:31	16.41	15.56	16.33
6:32	16.43	15.51	16.32
6:33	16.41	15.44	16.30
6:34	16.43	15.42	16.37
6:35	16.47	15.40	16.37
6:36	16.40	15.36	16.34
6:37	16.50	15.31	16.41
6:38	16.38	15.32	16.28
6:39	16.33	15.26	16.22
6:40	16.30	15.24	16.20
6:41	16.30	15.18	16.19
6:42	16.34	15.02	16.18
6:43	16.28	14.96	16.12
6:44	16.24	15.09	16.08
6:45	16.26	15.09	16.09
6:46	16.24	15.03	16.08
6:47	16.21	15.05	16.11
6:48	16.45	14.37	16.25
6:49	15.74	14.59	15.73
6:50	15.54	15.22	15.53
6:51	15.62	15.65	15.53
6:52	15.70	15.83	15.70

Time	T1	T2	T3
10/16/2004			
6:53	15.67	15.76	15.77
6:54	15.94	15.69	15.94
6:55	15.93	15.60	16.01
6:56	15.96	15.54	16.12
6:57	16.19	15.42	16.12
6:58	15.88	15.14	15.93
6:59	15.99	14.95	16.01
7:00	16.09	15.03	16.06
7:01	16.14	14.95	16.08
7:02	16.17	15.09	16.07
7:03	16.22	14.98	16.07
7:04	16.21	14.47	16.04
7:05	16.30	14.10	16.19
7:06	16.25	14.40	16.13
7:07	16.22	14.79	16.11
7:08	16.19	15.12	16.08
7:09	16.24	14.39	16.14
7:10	16.04	14.57	15.96
7:11	16.07	14.72	15.99
7:12	16.17	14.83	16.10
7:13	16.10	14.27	16.03
7:14	16.10	13.41	16.01
7:15	16.38	13.03	16.17
7:16	16.53	13.25	16.27
7:17	16.12	13.96	16.00
7:18	15.91	14.78	15.82
7:19	15.91	15.22	15.83
7:20	15.97	15.55	15.89
7:21	16.06	15.78	15.97
7:22	16.15	15.96	16.08
7:23	16.14	15.25	16.10
7:24	16.08	14.59	16.04
7:25	16.20	14.13	16.18
7:26	16.41	13.94	16.23
7:27	16.76	13.73	16.38
7:28	16.40	13.81	16.27
7:29	16.07	14.60	16.01
7:30	16.04	15.04	15.95
7:31	16.06	15.31	15.99
7:32	16.08	15.53	16.02
7:33	16.13	15.77	16.06
7:34	16.22	15.92	16.14
7:35	16.15	15.76	16.16
7:36	16.31	14.97	16.19
7:37	16.71	14.20	16.39
7:38	16.79	13.99	16.53
7:39	16.51	14.05	16.41
7:40	16.27	14.67	16.18
7:41	16.26	15.36	16.16
7:42	16.22	15.68	16.12
7:43	16.24	15.79	16.15
7:44	16.28	15.92	16.19

Time	T1	T2	T3
10/16/2004			
7:45	16.34	15.84	16.24
7:46	16.40	15.44	16.31
7:47	16.45	14.96	16.36
7:48	16.46	14.51	16.37
7:49	16.44	14.36	16.35
7:50	16.72	14.18	16.46
7:51	16.76	14.16	16.53
7:52	16.51	14.56	16.41
7:53	16.33	14.99	16.26
7:54	16.31	15.25	16.23
7:55	16.31	15.48	16.20
7:56	16.32	15.65	16.24
7:57	16.37	15.72	16.29
7:58	16.36	15.55	16.30
7:59	16.37	14.78	16.30
8:00	16.71	14.29	16.47
8:01	16.81	14.12	16.51
8:02	16.50	14.49	16.37
8:03	16.34	15.16	16.24
8:04	16.33	15.67	16.24
8:05	16.34	15.96	16.25
8:06	16.34	16.02	16.26
8:07	16.35	15.53	16.28
8:08	16.39	15.01	16.32
8:09	16.45	14.83	16.37
8:10	16.67	14.65	16.45
8:11	16.87	14.50	16.58
8:12	16.84	14.54	16.66
8:13	16.88	14.55	16.68
8:14	16.94	14.56	16.73
8:15	16.92	14.55	16.75
8:16	16.95	14.61	16.77
8:17	16.96	14.68	16.80
8:18	16.97	14.73	16.82
8:19	16.98	14.78	16.82
8:20	16.80	15.15	16.70
8:21	16.72	15.40	16.62
8:22	16.67	15.14	16.52
8:23	16.64	14.94	16.51
8:24	16.62	14.98	16.51
8:25	16.59	15.35	16.48
8:26	16.54	15.51	16.46
8:27	16.50	15.57	16.45
8:28	16.52	15.59	16.48
8:29	16.57	15.57	16.48
8:30	16.57	15.55	16.46
8:31	16.47	15.48	16.39
8:32	16.58	15.30	16.51
8:33	16.66	14.83	16.53
8:34	16.77	14.68	16.51
8:35	16.89	14.62	16.63

continued

Time	T1	T2	T3
10/16/2004			
8:36	16.90	14.74	16.73
8:37	16.95	14.64	16.75
8:38	16.98	14.44	16.79
8:39	16.99	14.36	16.82
8:40	17.00	14.38	16.83
8:41	16.99	14.55	16.85
8:42	17.02	14.71	16.86
8:43	16.91	15.02	16.80
8:44	16.79	15.69	16.70
8:45	16.74	15.45	16.64
8:46	16.66	14.93	16.53
8:47	16.62	14.80	16.50
8:48	16.33	14.85	16.35
8:49	16.11	15.25	16.12
8:50	16.18	15.45	16.23
8:51	16.35	15.50	16.32
8:52	16.49	15.50	16.37
8:53	16.56	15.49	16.46
8:54	16.48	15.44	16.39
8:55	16.37	15.38	16.26
8:56	16.49	15.05	16.40
8:57	16.76	14.88	16.54
8:58	16.90	14.72	16.57
8:59	16.95	14.77	16.71
9:00	16.96	14.85	16.78
9:01	17.01	14.89	16.82
9:02	17.03	14.91	16.86
9:03	17.05	14.94	16.89
9:04	17.05	14.95	16.90
9:05	16.98	15.07	16.88
9:06	16.91	15.58	16.81
9:07	16.89	15.96	16.79
9:08	16.87	15.46	16.72
9:09	16.87	15.09	16.72
9:10	16.86	15.02	16.75
9:11	16.85	15.16	16.75
9:12	16.76	15.36	16.69
9:13	16.74	15.45	16.66
9:14	16.78	15.46	16.69
9:15	16.74	15.45	16.69
9:16	16.73	15.44	16.62
9:17	16.75	15.42	16.64
9:18	16.83	15.34	16.72
9:19	16.82	15.24	16.73
9:20	16.95	15.03	16.78
9:21	17.02	14.82	16.84
9:22	17.08	14.87	16.91
9:23	17.09	14.96	16.96
9:24	17.10	15.01	16.97
9:25	17.11	15.04	16.98
9:26	17.12	15.06	17.01
9:27	17.13	15.05	17.01

Time	T1	T2	T3
10/16/2004			
9:28	17.12	15.11	17.02
9:29	17.11	15.44	17.02
9:30	17.08	15.54	16.98
9:31	17.04	15.55	16.94
9:32	17.01	15.34	16.89
9:33	17.00	15.08	16.83
9:34	16.99	15.04	16.85
9:35	16.96	15.19	16.85
9:36	16.93	15.69	16.83
9:37	16.91	15.83	16.82
9:38	16.92	15.84	16.83
9:39	16.96	15.83	16.85
9:40	16.96	15.80	16.88
9:41	16.88	15.77	16.79
9:42	16.89	15.66	16.81
9:43	16.97	15.46	16.89
9:44	16.96	15.35	16.85
9:45	17.07	15.00	16.89
9:46	17.10	14.97	16.94
9:47	17.13	15.07	17.00
9:48	17.13	15.12	17.01
9:49	17.15	15.14	17.04
9:50	17.16	15.17	17.05
9:51	17.16	15.18	17.05
9:52	17.17	15.17	17.06
9:53	17.17	15.29	17.06
9:54	17.14	15.82	17.04
9:55	17.11	16.15	17.01
9:56	17.11	15.90	16.97
9:57	17.09	15.70	16.99
9:58	17.11	15.63	17.01
9:59	17.11	15.67	17.02
10:00	17.12	15.84	17.03
10:01	17.12	15.90	17.02
10:02	17.12	15.89	17.02
10:03	17.13	15.88	17.04
10:04	17.09	15.87	17.02
10:05	17.07	15.86	17.02
10:06	17.12	15.85	17.05
10:07	17.17	15.78	17.07
10:08	17.20	15.40	17.07
10:09	17.21	15.44	17.10
10:10	17.22	15.49	17.12
10:11	17.22	15.52	17.13
10:12	17.22	15.53	17.13
10:13	17.22	15.53	17.13
10:14	17.23	15.61	17.14
10:15	17.23	15.75	17.14
10:16	17.24	15.78	17.15
10:17	17.25	15.82	17.16
10:18	17.27	16.07	17.17
10:19	17.27	16.23	17.17

Time	T1	T2	T3
10/16/2004			
10:20	17.27	16.17	17.16
10:21	17.31	16.11	17.19
10:22	17.31	16.07	17.20
10:23	17.34	16.11	17.23
10:24	17.34	16.23	17.24
10:25	17.33	16.24	17.23
10:26	17.33	16.21	17.22
10:27	17.34	16.20	17.23
10:28	17.36	16.18	17.26
10:29	17.38	16.16	17.27
10:30	17.37	16.16	17.27
10:31	17.36	16.15	17.26
10:32	17.36	16.04	17.28
10:33	17.31	15.85	17.26
10:34	17.31	15.91	17.26
10:35	17.30	15.93	17.24
10:36	17.30	15.94	17.24
10:37	17.29	15.95	17.23
10:38	17.29	15.95	17.23
10:39	17.30	15.94	17.23
10:40	17.30	15.92	17.23
10:41	17.32	16.08	17.23
10:42	17.31	16.33	17.23
10:43	17.31	16.45	17.22
10:44	17.26	16.66	17.15
10:45	17.11	16.68	16.96
10:46	17.09	16.54	16.95
10:47	17.11	16.62	16.99
10:48	17.13	16.80	17.03
10:49	17.15	16.79	17.04
10:50	17.15	16.80	17.05
10:51	17.16	16.85	17.06
10:52	17.16	16.89	17.06
10:53	17.16	16.85	17.07
10:54	17.16	16.77	17.07
10:55	17.16	16.74	17.07
10:56	17.16	16.73	17.06
10:57	17.16	16.74	17.06
10:58	17.15	16.75	17.06
10:59	17.16	16.77	17.06
11:00	17.16	16.79	17.06
11:01	17.15	16.80	17.06
11:02	17.15	16.83	17.06
11:03	17.15	16.85	17.06
11:04	17.15	16.87	17.06
11:05	17.16	16.90	17.07
11:06	17.16	16.94	17.07
11:07	17.19	16.97	17.09
11:08	17.25	17.00	17.06
11:09	15.44	17.07	16.37
11:10	14.72	17.13	16.01

continued

Time	T1	T2	T3
10/16/2004			
11:11	14.15	17.11	15.91
11:12	13.86	17.09	16.02
11:13	13.68	17.06	16.13
11:14	13.78	17.04	15.97
11:15	13.70	17.02	15.59
11:16	13.31	17.00	15.35
11:17	13.57	16.99	15.29
11:18	13.99	16.98	15.25
11:19	14.15	16.97	15.40
11:20	14.91	16.96	15.44
11:21	15.63	16.95	15.36
11:22	16.15	16.94	15.36
11:23	16.65	16.94	15.27
11:24	17.08	16.93	15.28
11:25	17.46	16.92	15.30
11:26	17.74	16.91	15.43
11:27	18.02	16.91	15.48
11:28	18.23	16.90	15.51
11:29	18.40	16.90	15.64
11:30	18.49	16.90	15.94
11:31	18.69	16.90	16.17
11:32	18.90	16.90	16.26
11:33	19.06	16.90	16.36
11:34	19.06	16.90	16.52
11:35	18.88	16.90	16.73
11:36	18.91	16.91	16.82
11:37	18.91	16.91	17.05
11:38	19.01	16.92	17.12
11:39	19.08	16.93	17.18
11:40	19.15	16.94	17.25
11:41	19.41	16.95	17.48
11:42	19.72	16.95	18.19
11:43	19.88	16.96	18.40
11:44	19.93	16.98	19.00
11:45	20.09	17.00	19.31
11:46	20.18	17.02	19.37
11:47	20.18	17.03	19.42
11:48	20.14	17.05	19.55
11:49	20.20	17.06	19.52
11:50	20.33	17.08	19.61
11:51	20.47	17.09	20.05
11:52	20.68	17.11	20.40
11:53	20.87	17.12	20.57
11:54	20.88	17.13	20.65
11:55	20.91	17.14	20.79
11:56	21.00	17.17	20.91
11:57	21.01	17.19	20.94
11:58	21.12	17.21	21.01
11:59	21.23	17.24	21.02
12:00	21.23	17.28	20.98
12:01	21.21	17.31	20.96
12:02	21.12	17.33	20.94

Time	T1	T2	T3
10/16/2004			
12:03	21.16	17.36	20.99
12:04	21.31	17.40	21.09
12:05	21.38	17.43	21.18
12:06	21.29	17.44	21.20
12:07	21.22	17.45	21.22
12:08	21.09	17.47	21.16
12:09	21.07	17.48	21.16
12:10	21.07	17.50	21.17
12:11	21.38	17.52	21.41
12:12	21.66	17.56	21.69
12:13	21.87	17.57	21.89
12:14	22.06	17.58	22.07
12:15	22.13	17.60	22.15
12:16	22.11	17.63	22.20
12:17	22.07	17.64	22.24
12:18	22.11	17.65	22.32
12:19	22.26	17.68	22.44
12:20	22.31	17.70	22.53
12:21	22.28	17.72	22.58
12:22	22.26	17.75	22.61
12:23	22.36	17.78	22.65
12:24	22.47	17.81	22.74
12:25	22.59	17.84	22.86
12:26	22.60	17.86	22.85
12:27	22.57	17.85	22.81
12:28	22.66	17.87	22.90
12:29	22.62	17.90	22.93
12:30	22.59	17.92	23.02
12:31	22.59	17.96	23.07
12:32	22.62	17.99	23.13
12:33	22.78	18.03	23.18
12:34	22.88	18.06	23.18
12:35	22.86	18.09	23.20
12:36	22.92	18.12	23.26
12:37	22.86	18.15	23.25
12:38	22.88	18.18	23.31
12:39	22.94	18.21	23.37
12:40	22.97	18.24	23.36
12:41	23.12	18.26	23.50
12:42	23.18	18.28	23.60
12:43	23.11	18.29	23.62
12:44	23.04	18.32	23.60
12:45	22.93	18.35	23.60
12:46	22.91	18.38	23.66
12:47	22.91	18.40	23.70
12:48	22.91	18.43	23.69
12:49	23.02	18.46	23.74
12:50	22.98	18.48	23.79
12:51	22.88	18.50	23.66
12:52	22.95	18.53	23.69
12:53	23.04	18.55	23.84
12:54	23.04	18.57	23.90

Time	T1	T2	T3
10/16/2004			
12:55	23.03	18.58	23.84
12:56	23.04	18.60	23.89
12:57	23.21	18.61	23.97
12:58	23.26	18.62	24.05
12:59	23.17	18.64	24.04
13:00	23.25	18.67	24.10
13:01	23.29	18.69	24.11
13:02	23.28	18.72	24.11
13:03	23.23	18.74	24.13
13:04	23.22	18.77	24.21
13:05	23.29	18.79	24.30
13:06	23.35	18.81	24.31
13:07	23.44	18.83	24.30
13:08	23.42	18.85	24.32
13:09	23.41	18.87	24.25
13:10	23.47	18.88	24.21
13:11	23.53	18.90	24.26
13:12	23.62	18.92	24.42
13:13	23.61	18.94	24.46
13:14	23.54	18.96	24.37
13:15	23.56	18.96	24.34
13:16	23.65	18.97	24.38
13:17	23.69	18.98	24.39
13:18	23.55	19.01	24.17
13:19	23.35	19.04	23.89
13:20	23.24	19.07	23.84
13:21	23.10	19.10	23.78
13:22	22.99	19.12	23.70
13:23	22.89	19.14	23.87
13:24	22.92	19.14	24.12
13:25	23.05	19.15	24.23
13:26	22.88	19.17	24.12
13:27	22.78	19.19	24.07
13:28	22.91	19.19	24.13
13:29	22.99	19.19	24.00
13:30	22.71	19.19	23.88
13:31	21.19	19.21	23.86
13:32	19.04	19.23	23.85
13:33	18.34	19.24	23.68
13:34	18.36	19.27	23.52
13:35	18.51	19.30	23.28
13:36	18.42	19.32	22.93
13:37	18.43	19.14	22.53
13:38	19.30	18.73	22.12
13:39	19.15	18.18	21.61
13:40	18.99	17.85	21.13
13:41	18.98	17.79	20.65
13:42	19.14	17.69	19.94
13:43	18.95	17.44	19.23
13:44	18.76	17.35	18.83

Appendix F – Calibration of gas chromatograph

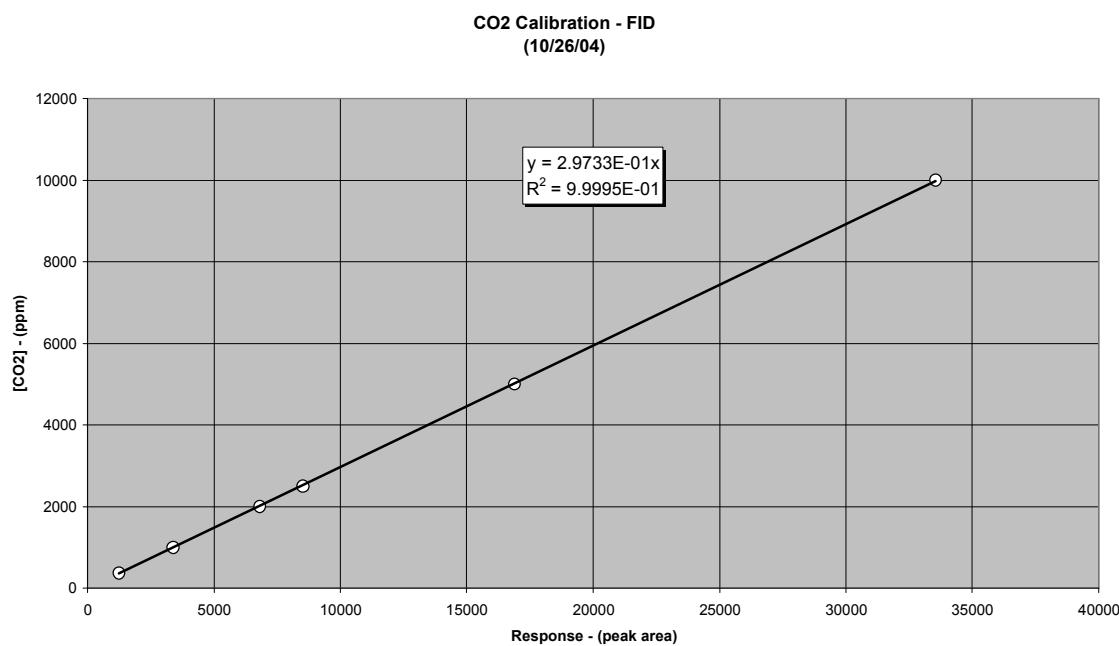


Figure F-1. CO₂ calibration using the FID, 369 ppm to 1%.

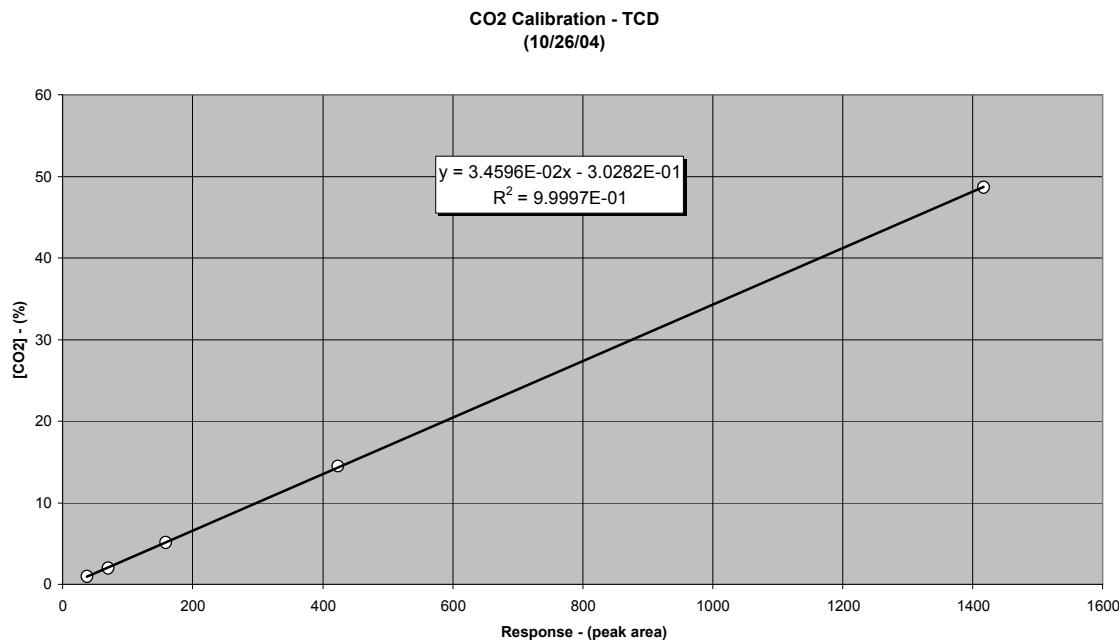


Figure F-2. CO₂ calibration using the TCD, 1% to 48.7%.

Table F-1. FID and TCD calibration data for CO₂ analyses of Crystal Geyser air samples.

FID Calibration Data (10/26/04)

Sample ID	Run #	Sample Desc.	Comments	Response (peak area-FID)	[CO ₂] (ppm)
LowStd#1	fid128	Matheson Std.	Cal. Plot	1252	369
LowStd#2	fid129	Dil. Of 2% Std.	Cal. Plot	3386	1000
LowStd#3	fid130	Dil. Of 2% Std.	Cal. Plot	6814	2000
LowStd#4	fid131	Dil. Of 2% Std.	Cal. Plot	8523	2500
LowStd#5	fid132	Dil. Of 2% Std.	Cal. Plot	16898	5000
LowStd#6	fid133	Dil. Of 2% Std.	Cal. Plot	33542	10000

FID Calibration Checks (10/26/04)

Sample ID	Run #	Expected Conc. (ppm)	Comments	Response (peak area-FID)	[CO ₂] - Calculated (ppm)	%D
LowStd#1	fid85	369	Cal. Check	1263	376	-1.8
LowStd#2	fid84	1000	Cal. Check	3396	1010	-1.0
LowStd#3	fid83	2000	Cal. Check	6830	2031	-1.5
LowStd#4	fid82	2500	Cal. Check	8571	2548	-1.9
LowStd#5	fid81	5000	Cal. Check	17162	5103	-2.1
LowStd#1	fid234	369	Cal. Check	1258	374	-1.4
LowStd#2	fid235	1000	Cal. Check	3386	1007	-0.7
LowStd#3	fid236	2000	Cal. Check	6771	2013	-0.7
LowStd#4	fid237	2500	Cal. Check	8474	2520	-0.8
LowStd#5	fid238	5000	Cal. Check	16749	4980	0.4
LowStd#6	fid239	10000	Cal. Check	33540	9972	0.3

TCD Calibration (10/26/04)

Sample ID	Run #	Sample Desc.	Comments	Response (peak area-TCD)	[CO ₂] (%)
HighStd#1	tcd133	Dil. Of 2% Std.	Cal. Plot	37.178	1.0
HighStd#2	tcd134	Matheson Std.	Cal. Plot	69.797	2.0
HighStd#3	tcd135	Matheson Std.	Cal. Plot	158.3	5.2
HighStd#4	tcd136	Matheson Std.	Cal. Plot	423.3	14.5
HighStd#5	tcd137	Matheson Std.	Cal. Plot	1416.7	48.7

TCD Calibration Checks (10/26/04)

Sample ID	Run #	Expected Conc. (%)	Comments	Response (peak area-TCD)	[CO ₂] - Calculated (%)	%D
HighStd#1	tcd123	1.0	Cal. Check	36.848	1.0	2.8
HighStd#2	tcd124	2.0	Cal. Check	69.328	2.1	-4.8
HighStd#3	tcd105	5.2	Cal. Check	156.127	5.1	1.0
HighStd#4	tcd106	14.5	Cal. Check	420.097	14.2	1.9
HighStd#5	tcd107	48.7	Cal. Check	1404.182	48.3	0.8
HighStd#1	tcd239	1.0	Cal. Check	36.585	1.0	3.7
HighStd#2	tcd240	2.0	Cal. Check	68.581	2.1	-3.5
HighStd#3	tcd241	5.2	Cal. Check	157.534	5.1	0.1
HighStd#4	tcd242	14.5	Cal. Check	416.641	14.1	2.7
HighStd#5	tcd243	48.7	Cal. Check	1396.854	48.0	1.3

Appendix G – Photographs



Photo G-1. Geyser of Eruption 1. Taken 14 Oct, 17:30 MDT.



Photo G-3. Base of primary geyser showing two of the temperature probes. Taken 15 Oct, 12:07 MDT.



Photo G-2. Taking air sample downwind of primary geyser during Eruption 3. Taken 15 Oct, 7:20 MDT.

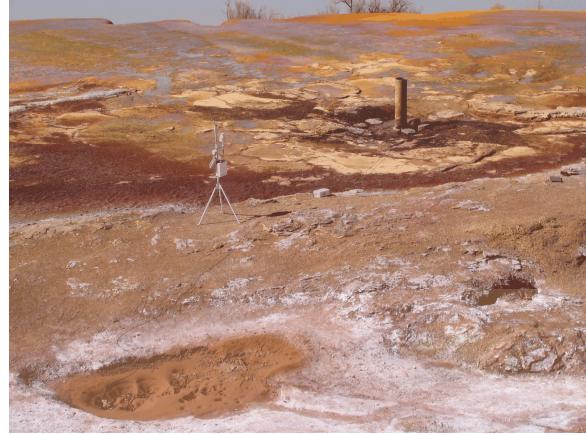


Photo G-4. From above showing from bottom left to upper right the secondary geyser, meteorological station, primary geyser. At the top is the Green River. Taken 15 Oct, 12:14 MDT.



Photo G-5. Looking south over the sampling grid. The primary geyser is just left of center. Sampler 100m³ is in the foreground. Taken 15 Oct, 11:40 MDT.



Photo G-6. The sampling grid from the hill east of the geyser. Mackenzie Johnson is standing at sampler 50m³. Arrows are pointing to the other samplers on the 50-, 75-, and 100-m arcs. Taken 15 Oct, 12:25 MDT.